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PAPIER-MÂCHÉ.

How to Mould It and Ornament It.

BY SYLVANUS WARD.

I.—CONSTRUCTION IN PAPIER-MÂCHÉ—NAME AND ORIGIN OF MATERIAL—PULP—MOULDING ON MODEL—APPLIANCES REQUIRED—MOULDING ROUNDED FORMS—MAKING FLAT PANEL—MAKING VASES OF SIMPLE AND ORNATE FORMS.

PAPIER-MÂCHÉ, which, literally translated, means "chewed paper," is a term which we have been accustomed to hear applied to a great variety of products made by a pulping process, and some of which contain no paper whatever. If we look for the origin of the name we shall find that it was first applied to a coarse, unglazed paper reduced to a pulp, and then mixed with gum or glue paste, thus forming a substance plastic whilst wet, and when dry as hard, or harder than most woods, and unlike them not liable to crack. As the name would seem to indicate, the inventor, or reputed inventor, was a Frenchman—one Lefevre. About 1740 this person is said to have imparted his discovery to a German snuff-box maker named Martin, by whom it was found to be of commercial value in his trade. In or near the year 1745, John Baskerville, of Birmingham, the famous printer, took the matter up, and before long the manufacture of papier-mâché became an important industry in Birmingham and its district. Later on various fibres or fibrous materials, pulped and mixed with adhesive substances, have been known as papier-mâché; scrap leather, wood fibre imported from Sweden, potato peelings, and even sawdust, having, it is said, been made to take the place of paper; whilst in some preparations china clay, a substance apparently little suited for the purpose, has formed a large, if not an important, part of the admixture.

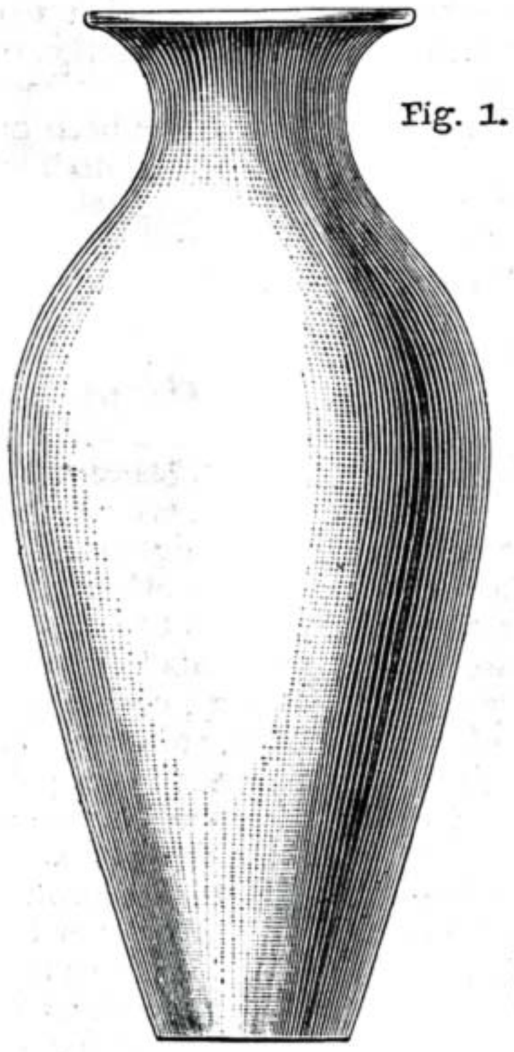

Fig. 1.

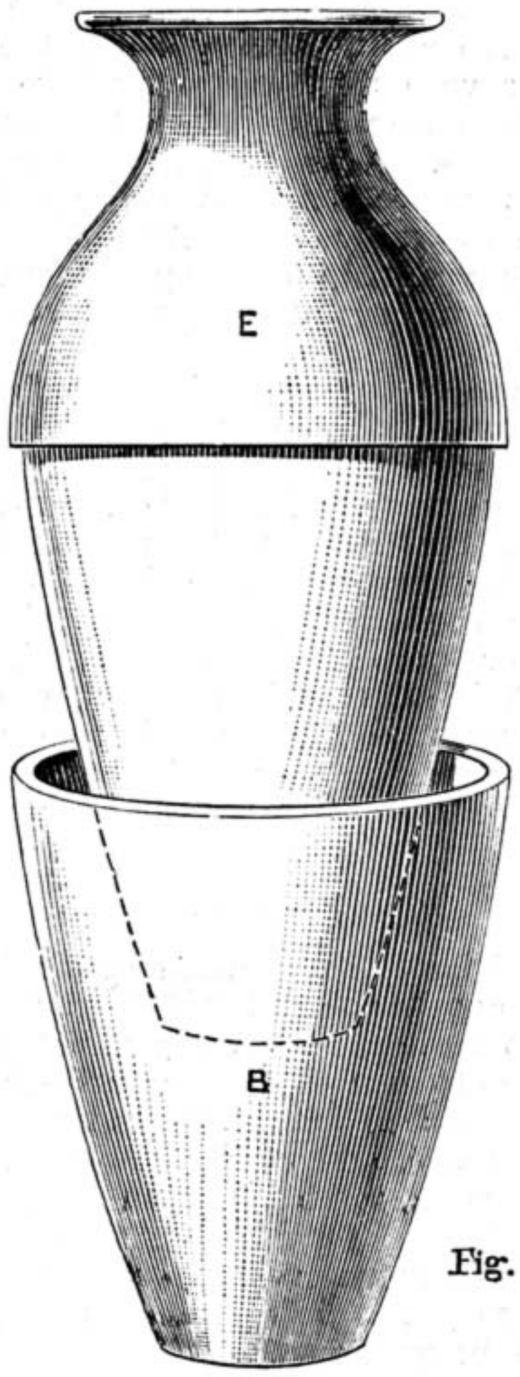

Fig. 3.

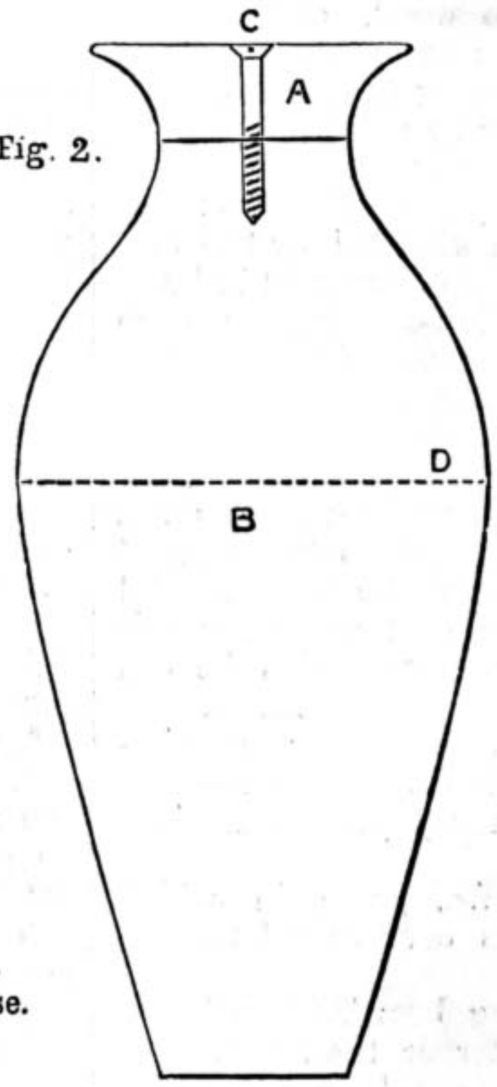

Fig. 2.

Fig. 1.—Plain Vase in Papier-Mâché.
Fig. 2.—Wooden Model for Plain Vase.
Fig. 3.—Taking out the Core.

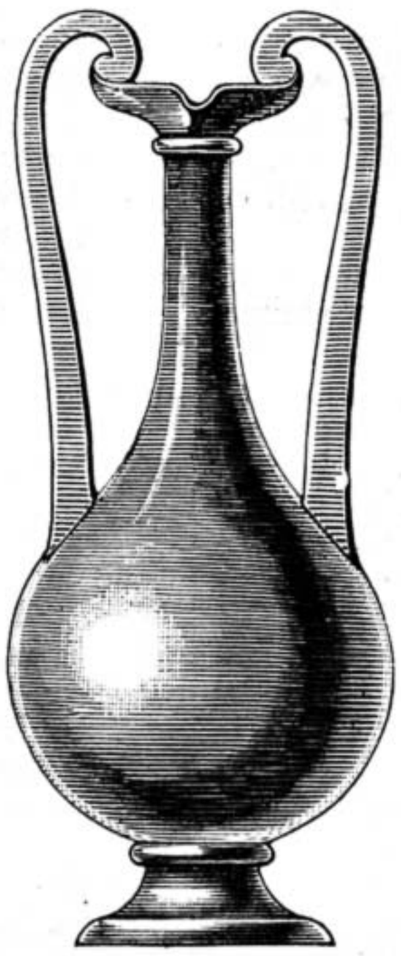

Fig. 4.—Vase with Paper Foot and Handles.

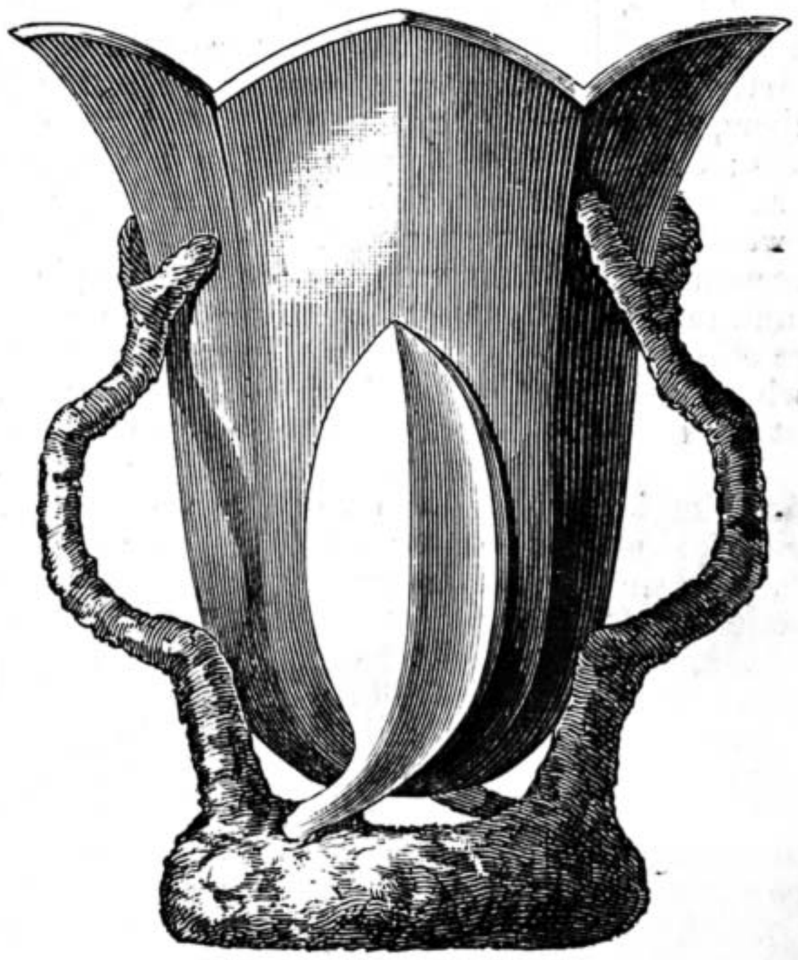

Fig. 5.—The "Lily" Vase.

In Baskerville's days there were reasons why an invention of the nature of papier-mâché should have been eagerly welcomed. The introduction of Oriental lacquered wares by the Dutch and English East India Companies in the latter part of the preceding century had created a fashion for such things, and roused a desire of imitation. Many of these imitations—the earliest efforts of the japanner's art in England—still remain. They are mostly clock cases, and the lids of corner cupboards, and are on wood, generally oak panel. Very curious some of them are; we call to mind one in which a shepherd and shepherdess, in the sham-pastoral taste of the day, are seated under a *bamboo* tree; the latter being, of course, borrowed from an Oriental original.

But wood, with its tendency to crack, and its rough grain, was not well suited to the japanner's art; and the advantages of papier-mâché were at once seen. It was plastic, and could be moulded to the required form; it would not crack, and, when dressed and covered with the black varnish of the japanner, it presented a level surface equal in uniformity to that of the lacquered wares of the East.

Yet this first papier-mâché did not prove to be altogether satisfactory. It is true that a fine surface was obtained, but that surface was not always to be relied upon as permanent; for if the article became overheated in any of the dryings to which it was subjected during decoration, it was apt to become wavy, or, in the technical language of the japanner, to go "curdled." Hence an improved material was a desideratum.

This was introduced in 1772, when Henry Clay, one of Baskerville's apprentices, took

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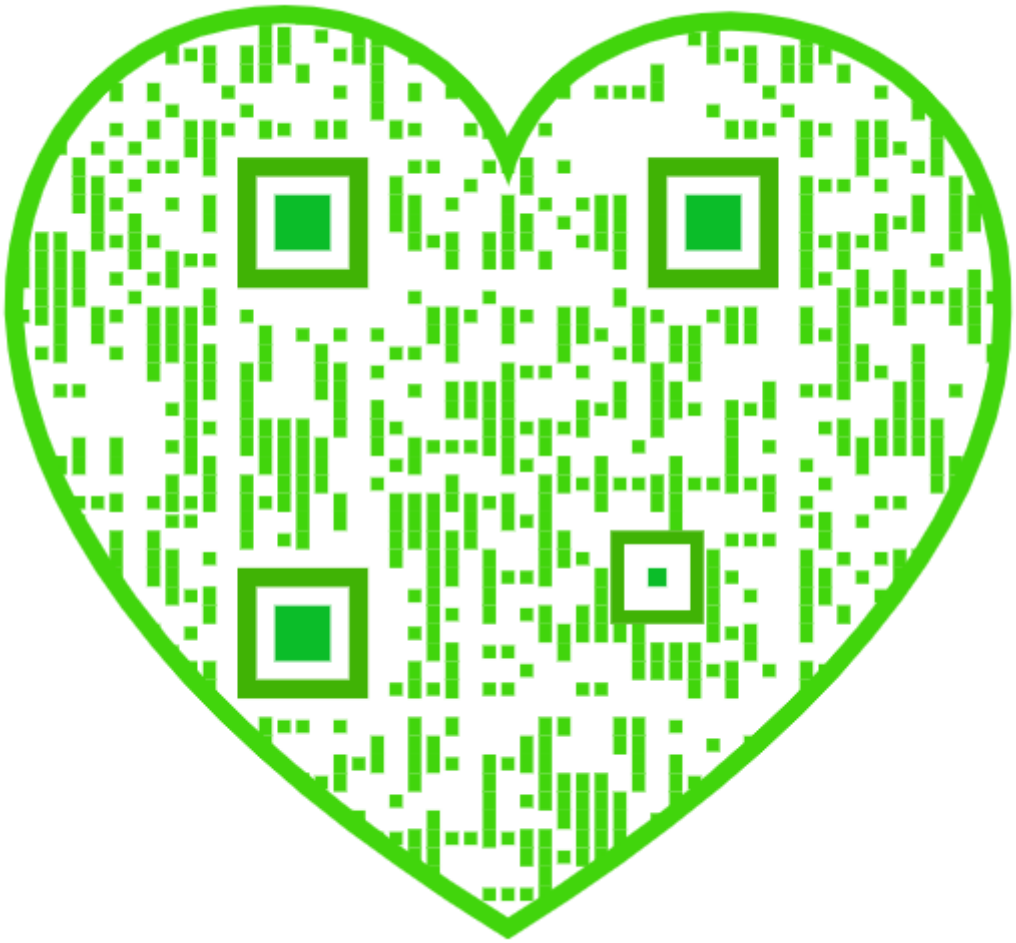

out a patent for papier-mâché (though that name was no longer really appropriate), made by a new process. His plan was to form a solid mass of fibre by pasting sheets of paper together, and hardening it by saturation with oil. This gave a fine surface which, under proper management, was no longer liable to curdle. Thenceforward the pulped papier-mâché was used by japanners for inferior purposes only, their best articles being moulded by pasting.

In the process thus improved—and, it may be said, perfected, for a better substance in which to work, or a better ground on which to japan, could scarcely be desired—a rather thick, unglazed paper was used. The sheets of this were pasted together until (if a flat piece were wanted) a board or panel of some ¼ in. in thickness was formed; whilst rounded or ornamental forms were made by pasting the paper upon wooden models turned or worked into the shape which it was desired to reproduce in papier-mâché. By a combination of these moulded forms and panels it was found that any article within the range of the cabinet-maker's art could be produced, as well as others generally produced in plastic materials. The joiner could work in this paper substance precisely as in wood, except that carving was not attempted; but this was not wanted, its place being supplied by gold or colour decoration, or by pearl inlaying, or by a combination of two or all.

Of the strength of papier-mâché thus made an illustration may be afforded by the fact that when the writer was learning the business, he and his fellow-apprentices were accustomed to make cannons of it some 8 in. long, which would bear repeated firings, with fairly large charges of powder, without bursting.

For the worker in papier-mâché on a small scale, the pasting process has especial advantages. Instead of the moulds and presses wanted for pulp, he needs for this only a wooden model from which he can reproduce as many copies as he pleases.

Provided with this model, his requirements for making paper articles are :—

Rather thick unglazed paper in sufficient quantity.

Strong glue-paste, *i.e.*, paste in which some Russian glue has been boiled to give additional strength.

A brush and pasting board. The board should be somewhat larger than the sheets of paper which are to be laid upon it.

Grease or oil to anoint the models to make them leave; and a sufficient vessel of linseed oil to "bath" or soak the articles.

Also sand paper of various numbers, glue, and a few ordinary carpenter's tools; these are for treating the papier-mâché substance much in the same manner as wood. A tenon saw will in especial be necessary to saw the paper from the models; and rasps, it should be remembered, are more effective on this substance than files; whilst for planing it a toothed plane like that used for veneers is to be preferred.

Modelling.—Moulding a vase.—As a simple example of moulding on the model, let us take the plain vase (a well-known form in the trade), Fig. 1. For this the model must be in two pieces, as shown in Fig. 2, the top, A, being turned separately, and only attached to B by the screw at C. American birch has been the wood usually employed for such models, and before being used it must be thoroughly dried and repeatedly oiled with linseed oil till the surface ceases to be porous. The materials being provided, the operations of moulding are as follows :—

Rub oil or grease over the model, that the paper saturated with paste may leave it when required.

Cut up the paper into half or quarter sheets, or smaller if the size of the model demands it, and pile, say, half a dozen of these pieces on the pasting board.

With the brush dipped in hot paste, well saturate one side of the porous paper; then turn the piece over the sheet below, and treat the other side in the same manner. By thus doing the sheet below will be partially "satisfied," and surplus paste utilised.

Apply the saturated slip of paper to the model, covering as much of the surface as possible without leaving wrinkles, creases, or breaks. Continue this till the whole model is coated, pressing down the paper all over with the hand, and where needed with a smooth piece of wood, to squeeze out air bubbles. Note that the edges of the paper are to be turned down over the top and bottom of the model. At present these overlappings help to keep the coating in place, and they will be removed at the proper time.

The model having received its first coating, proceed to paste others above it to the number of four or five, taking care so to press each down as it is laid on as to squeeze out every air bubble, and to rub out wrinkles and creases as much as possible.

Place the model with its coverings in a stove or oven for the night. A gentle warmth is all that is required, the object being not to bake but only to dry. The domestic kitchen oven suffices for articles of moderate size. In the morning a hard shell of paper will be found to surround the wooden core.

Examine this to see if any blisters have arisen from the expansion of air bubbles, and if any are found cut them out. The holes so made must be stopped with a thick mixture of paste and paper dust—the latter being produced by sawing and rasping the papier-mâché, and of which waste, as the work goes on, there will soon be plenty on hand.

File off any inequalities, such as wrinkles, so as to get a fairly smooth surface to receive the next coat.

The wooden model or core may now be removed, and as a first step pare off the superfluous paper at top and bottom with a keen knife.

With a tenon saw cut through the paper along the dotted line at D, Fig. 2. The lower part of the vase will then slip off the model, as shown in Fig. 3. Remove the screw, C, and the two parts of the model becoming detached, one will slip upwards, the other downwards from the upper half of the paper vase.

The vase is now in two pieces, B and E, Fig. 3. These have to be glued together. The result is a thin, hollow, paper vase.

The glued joint having dried, the vase has to be covered with some four or five more coats of paper in the same manner as before. It has then to be again dried, air bubbles looked for and treated as before, and inequalities again filed down; these processes being repeated till the vase has reached the required thickness, which may, perhaps, be a quarter of an inch.

It should be borne in mind that it is better to build up the vase, or any other article, by several pastings of a few sheets at a time than to get the thickness by fewer and heavier pastings. The latter may appear to save time, but it would result in uncertain and inferior work. The exact number of sheets to be applied at one time must depend on the thickness of the paper, and as that may vary, it is impossible to speak on this point with precision.

Directions have been given for cutting the paper from the model after the first drying, but this must depend on circumstances. The thickness may not be sufficient for gluing, and in that case it will be better to put a second pasting of paper upon the first while the model remains within. Not only the glued joint, but the whole paper shell, needs to be strong enough to bear the rubbing it will receive in putting on the next coat.

The requisite thickness having been gained, it will be well to give the surface a rough dressing by filing and sand-papering—in a lathe by preference—in the case of a rounded object like the present. This preliminary dressing makes the paper absorb the oil better. The lower end has then to be smoothed off, and the bottom, which will be cut from a piece of paper panel, glued on.

The article is now ready to be laid to soak in a bath of linseed oil, in which it should remain for, say, two or three days. When taken out it will require to be dried in a warm, but not hot, stove or oven. The oil will be found to have penetrated every part of the mass, which will be hard enough to be turned in a lathe, or to be worked in any other way in the same manner as wood.

Mention has been made above of flat panel being required to form the bottom of the vase. Such panel will be required for many purposes, and making it is a very simple matter. The sheets of paper have merely to be pasted on a flat board (which will need to be cross-clamped to prevent warping), and the alternate pastings and dryings enumerated above will have to be gone through. If a panel becomes warped, as it may perhaps do, after being cut from the board, it may be straightened by being put in a cool place, as a cellar, under weights, and also weighted in the stove when drying.

As regards the paper to be used, it is no longer easy, or perhaps possible, to procure the thick, soft, unglazed paper manufactured for the trade in the palmy days of japanning; yet plenty of varieties are to be got well fitted for the purpose. It needs only that they should be thoroughly porous and pliable. With a thick paper the more rapid progress is made, but with a thinner one smoother and better work will, as is obvious, be secured, especially if the form be a difficult one.

Vases similar or approaching in form to Fig. 1 are frequently to be met with in old papier-mâché work fitted with brass feet and handles; but in Fig. 4, which is a vase somewhat more complicated and less easy to model, it will be observed that both foot and handles are made of paper. The handles are cut from a piece of flat panel and glued on. The core or model for this vase requires a separate piece of wood for the foot as well as for the lip.

Of a more ornate character is the vase shown in Fig. 5. This is a form sometimes to be found in old work, and was called the "Lily" vase. Its shape would seem to have been suggested by some favourite work in china. This vase is scarcely offered as an easy example for the beginner, but rather to show how the pasting process may be applied to designs of considerable intricacy. The rustic base and the stems which serve as handles are not like the vase itself, pasted, but are of pulp, built up a little at a time and stoved after each addition, the rasp being afterwards used to finish them.

(To be continued.)

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ARTISTIC FURNITURE

EASILY MADE AND CHEAPLY PRODUCED.

BY DAVID ADAMSON.

AN OVERMANTEL WITH CUPBOARDS (*continued*).

FITTING FRIEZE — BOTTOM BOARDS — MOULDING —CUTTING MITRES—MITRE BOX—CUTTING MOULDINGS—MITRED JOINTS—GLUING—ENDS OF CUPBOARDS—DENTILS—PRINTERS' REGLETS AS DENTILS — FIXING DENTILS — DOORS — FRAMING FOR DOORS—RABBET OR REBATE—FASTENING UP FRAMES—PANELS—FITTING AND ORNAMENTING PANELS—HINGES AND LOCK—SHAPED PIECES AT ENDS—SMALL SHELVES—PAINTING AND FINISHING—MANTEL BOARD—FIXING WITH GLASS-PLATES — MIRROR FOR OVERMANTEL.

WHEN the shelf has been affixed to the two pieces, either the top or frieze may be fastened. Perhaps, as it will to some extent serve as a guide, the latter may as well be temporarily nailed into the recess made for it. Immediately behind it, and with the lower surface of the top flush with its lower edge, the frieze, the top piece or covering of the centre part must be nailed to the ends like the shelf. As it stands, if the frieze be taken away it is, in fact, another shelf precisely like the lower one, only set back ¾ in. At this stage the job will consequently be as shown in Fig. 7.

Do not fix the frieze or top rail down yet permanently; better let it be removed altogether for the present, and continue the work by nailing up the two 11-in. boards. These are to be 8 in. from the bottom of the ends, and, it will be remembered, form the bottoms of the cupboards. The tops of the cupboards must also be fastened down, but, instead of them being within the ends, let them rest and be nailed *on* them. The job should now be as represented in Fig. 8, which is given to prevent any possibility of mistake as to the arrangement. One end, of course, only is shown. The frieze piece may next be finally placed and fastened down. See that it is quite long enough to fill up the whole of the space intended for it without leaving any unsightly gaps at the ends. Put one or two nails, or, in this instance preferably, screws through it into the inner ends of the cupboards, that is, those pieces in which the recesses were made; also a few, say, three or four, to hold it to the top of the centre part. Keep these latter as near the edge of the frieze as convenient, so that their heads may be covered by a strip of wood which will afterwards be placed there, and take particular care that all the screws are well sunk so that their heads do not project. A couple of screws should also be driven through the tops of the end cupboards into the frieze, when, if everything has been properly done, the whole structure should be perfectly rigid and firm. As the work proceeds, test it continually with the square. Do not be afraid of using this too frequently, and if it shows anything wrong do not pass the defects over without, at least, an attempt to correct them.

Now let us turn our attention to the moulding, which is such an important feature in the overmantel, and on which, with the shaped pieces at top of the centre opening and under the cupboards, almost the whole decorative effect may be said to depend. I do not advocate any beginner making his own mouldings, as they are not easy, and to form the various members properly not only implies skill but a stock of planes such as a novice is hardly likely to possess. Suitable machine-made mouldings are to be procured in any large town, and where the amateur cannot get the address of a maker or large dealer he may generally be able to obtain them through a builder, and many large cabinet-making firms will also be able to assist him. Still, as this may not be specific enough, it may be stated that in London machine mouldings may be obtained from Henry Smyth, 33, Wharf Road, City Road, N., who, as British agent for Ekman's Mechanical Joinery Company, of Stockholm, holds a large stock of them. The prices quoted are per 100 feet in lengths of about 12 feet. For mouldings of a finer character than those generally in request by builders, Mr. Samuel Elliott, Albert Mills, Newbury, Berks, may be recommended. In the overmantel the moulding is one of a very ordinary character, as will be seen by Fig. 9, where it is represented in section, full size. Of course, it by no means follows that others must adopt the same pattern, but the illustration gives a good idea of the size of what is suitable, and those who have the catalogues of either of the firms whose names have been given will have no difficulty in finding something appropriate. For example, among Smyth's architrave and panel mouldings there are over fifty designs, any one of which might be selected. I ought to say, to prevent disappointment in case of some choicer wood being used than that from packing cases or pine, that builders' mouldings are stocked almost exclusively in the latter wood only.

Whatever may be the pattern of the moulding, the only difficulty that it is possible there can be in adjusting it will be at the mitres or corners. If these are not accurately cut the members of the parts will not fit to each other, and no amount of "doctoring" can make them look right. Therefore, let every pains be taken to ensure a good mitre. It is not difficult with proper appliances, the simplest of which is perhaps that about to be described, and one which is as useful as any. It consists merely of three pieces of, say, 1-in. stuff, and of any convenient length—12 or 18 in. will be enough—fastened together as shown in Fig. 10. The sides must be parallel with each other and at right angles with the bottom. Saw cuts at an angle of 45 degrees (half a right angle) across the thickness of the sides must be cut perpendicularly through them from the top to the bottom, the position of the cuts being such that the saw will work through both sides, as in the plan, Fig. 11. The cuts form a guide for the saw, which it is evident will cut through any moulding held in the box, as shown in section, Fig. 12, at an angle of 45 degrees, and form a true mitre. By having cuts straight across, it will also be seen that this simple mitre box may be used as a guide in making rectangular cuts, as at the back ends of the mouldings. The manner of using this little appliance must, however, be so evident that it would be superfluous to make further remarks about it. A fine saw should be used in cutting the mitres, which I imagine there can be no doubt about; but in case any one should not understand, Fig. 13, showing a mitred joint, is given for his special benefit.

In cutting off pieces of mouldings for the ends, it will be as well for beginners to have them fully long. The surplus can easily be sawn off from the back afterwards. If preferred in this overmantel, mitred joints may be dispensed with altogether, and probably among experienced workers there would be considerable diversity of opinion whether it would not be preferable to shape the end to the moulding. After due consideration I am, however, bound to say that I do not fancy any but those skilled in such work would make so neat a job this way as by mitreing, nor would it have so workmanlike an appearance. Were we discussing this latter point, however, there is much that might be said on both sides, and it may fairly be left to professional technical journals to treat of. The moulding along the front may be cut of about the proper length, for as a break will have to be made at each of the four ends, any little irregularity can always be provided for when fixing up.

Before gluing any of the mouldings to the work it will be as well to make the mitred joint. To do so, cut the mitred end of the front piece, as shown in Fig. 14, where it will be seen that its length—if one may call it so—is just the same as the thickness of the end moulding. On fastening the two together it will be found that by this means the "return" of the moulding round the front end is effected. The result is, in fact, just what would have been got had the end of the moulding been cut as it was suggested above it might be, with the advantage, however, that there is no end-grain visible nor any unsightliness from the possibility or probability of the members not being evenly cut. Of course, both end mouldings must be treated in the same manner, the mitres being glued.

When the mouldings are ready for fixing they may be glued on to the ends of the overmantel, the upper surfaces of the mouldings being a little higher than the tops of the cupboards in case it should be thought afterwards that any blocking is necessary. This will be explained later on. A few brads may be used as auxiliary to the glue, but they should not be necessary, except, indeed, in hot, damp climates, where glue alone is not to be depended on. Without, however, giving here full instructions about the proper preparation and application of glue, both of which, especially the former, are of great importance, I may give the following hints:—See that the glue is hot; that both surfaces of the pieces to be attached are at least warm before gluing them; do not put the glue on too thickly; do not "dab" the moulding down, but slide it gently about to drive out air bubbles and superfluous glue; squeeze as much as possible of this out, and use cramps to hold the parts together tightly till the glue has set. Finally, those who do not understand the preparation of ordinary glue thoroughly will find it better to use Le Page's carriage glue. Why? Simply because this is always reliable, which even the best ordinary glue never is unless properly prepared.

The remainder of the moulding for the front must be cut into three lengths, one of them exactly the length of the centre opening, the other two the same as the cupboards. Perhaps before cutting them it will be as well to prepare the four small pieces of wood which are attached to the upper parts of the upright pieces or ends of the cupboards. These pieces, as will be seen in Figs. 2 and 3, rise above and project a little in front of the moulding, the shape of which they, to a certain extent, follow. The wood of which they are formed should be exactly the same thickness as that of the ends to which they are to be attached. Fig. 15 shows in full size the shape of these pieces with the relative positions of the moulding, etc. The work, of course, is done with the fret or bow saw, as already described. These pieces are merely glued on to uprights, though I have used a couple of fine brads as well, driven in through the thin flat part.

When the mouldings and these facing

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parts are fixed as described above, the dentils under the former may be prepared and fastened as well as the small square strip just along the bottom edge of the frieze. The exact size of the dentils is not of much importance, but the same cannot be said of their uniformity, not only in size but in every other respect, such as thickness and spacing. The easiest way to prepare them is to get out slips of the required width and thickness. Place several of these pieces on top of each other, fastening them here and there with a small brad or screw nail so as to form a solid block. Mark off on the top piece the required width (or length) of each dentil, this being best done with a pair of compasses, and saw through the block at each mark. The box, as for mitres, but with cut straight across, may be used as a guide for the saw, but it need hardly be suggested that the fret machine affords a ready means of doing the sawing, especially as from the comparatively fine teeth of the fret saws the cuts will be so clean as to need little, if any, papering to smooth them down. I have used that excellent machine, the Britannia Company's No. 8, to make a number of dentils, and, by forming a kind of guide to work along and on the top of its straight-sided table, the sawing is bound to be even. If some contrivance of this kind is not used, it will be desirable to mark across the top piece of the dentil stuff with a square.

Those workmen who desire to reduce the preparation of the dentils to the smallest amount of trouble may be informed that printers' reglets come in very handy. They are pieces of wood about $\frac{5}{8}$ in. wide of various thicknesses, each of which is known by a special name, and is always true to gauge. The labour of cutting wood to the required size is thus done away with altogether by those who prefer buying a few reglets; all that is then necessary being the cutting up into dentils. As some guide for the size of these it may be said that "pica" reglet is about the right thickness for such a piece of work as the present, and that $\frac{1}{2}$ in. is sufficient for the width of the dentils, etc. As all may not care about using reglet stuff, it may be said that $\frac{1}{8}$ to $\frac{3}{16}$ in. will do very well for the thickness of the stuff used for them.

Before gluing any of the dentils on to the frieze, mark this out for them in order to avoid irregularity in spacing. A dentil, not a space, should abut against each end, as shown in Fig. 2. In fixing them it will be just as well to use a needle point to each in addition to glue, which should be laid on as thinly as possible, for if any exude it will be found a tedious and troublesome job to remove it. The small piece along the lower edge of the frieze may be glued and bradded. Reglets, which, by the way, are sold at very low prices in lengths of 3 feet, will do very well for this, though perhaps the proportions shown on Fig. 15 present a more sightly appearance.

Now for the doors of the two cupboards. The construction of these will tax the novice's skill somewhat, though there is really nothing difficult about it. Naturally those who have acquired some facility in joinery will know that the top and bottom rails are attached to the upright pieces of the frames—or, as they are technically called, the styles, either with mortise and tenon joint or by dowelling. The tyro, however, may want something easier than either of these methods—or, if not easier, one more adapted to and likely to give better results in untrained hands. As has already been hinted, this may be managed by halving the pieces together. What this means will, I think, be understood without more words by Fig. 16, where the top rail is shown with half the thickness from the front, and the style with half the thickness from the back, cut away. On fitting these two together, it is evident that the front surfaces of both will be level.

Before showing how to manage this operation of halving in a systematic manner, let us see about the wood of which the door frames are to be made. From the directions already given, it goes without saying that the thickness is about $\frac{3}{4}$ in., though if they are more it is of no consequence. The width of the framing should be about $1\frac{3}{4}$ in. Four pieces will be required for each door—viz., two styles the exact length of the height, and two rails the width of the cupboard. These must be halved to fit each other, and, simple though the operation may be, it goes without saying that by method the work may be facilitated. In the present instance we will suppose that the different parts are to be literally halved, and the necessary rabbet in the frame for the panel to lie in to be cut afterwards. Not, perhaps, the most workmanlike way of proceeding, but the easiest for beginners. Skilled workers will know how to go about it otherwise; and perhaps, by-and-by, other methods may be described in this series of papers, leading the novice from easy construction onwards. For the present, having got the four pieces for the frame of the door ready, proceed as follows:—Mark the width of the styles off from the end across the front of the rails. Do the same on the back of the rails, taking the width of the styles as a guide. Set the gauge to about half the thickness of the wood, and from the points mark off on top, bottom and ends. There are now guide lines for the saw to remove the pieces, and it will be well to saw within the lines, so that the space made by the saw is included in the waste to be removed. If not the spaces will be too large, and a good fit will not be obtained.

The rabbet or recess round frame has still to be cut, and to prevent any misunderstanding by the use of this technical expression a part of the rabbeted frame is shown in section by Fig. 17. The recess is the rabbet, or as it is sometimes written, and perhaps with greater regard to correctness, "rebate." The proper tool to do this with is the rabbet plane, but a gauge, preferably a cutting gauge on account of the deeper cut it makes, and an ordinary chisel may be made to do very well. The gauge should be set to mark about $\frac{3}{8}$ in., and a line scribed with it round the inner thickness of the frame, working from the front. The reason why the marking for this and for the halving should be done from the front is that, in the event of the thickness of rails and styles not being identical, any inaccuracy will be at the back of the door, where it will not be so conspicuous. The other dimension for the rabbet is not a matter of much consequence, provided it is sufficient to hold the panel in. The marking being done, the piece can easily be cut away with a chisel, especially if a cutting gauge with the blade set to cut a good depth has been used. It will be understood that the rabbet is only cut round the opening, and not extended to the ends of the frame pieces. The edges may be left square in front, but it will be neater to bevel off the rails, as shown in section, Fig. 18. This will be done by shaving off the sharp edge with a plane. The frames may be fastened up with glue alone, but perhaps it will be just as well to assist its adhesion by a couple of screws at each joint. As already suggested, brass screws driven from the front could hardly be regarded as objectionable, unless on the ground that they are not usually seen in furniture; but there is no necessity for them being visible, except when the door is open, if they are driven in from the back. Care will, of course, in this case be taken not to bore the holes right through, nor to use screws as long as the thickness of the wood.

When the frames are ready the panels may be got out. They are only thin stuff, $\frac{1}{4}$ in. thickness being quite sufficient. In the illustration, Fig. 1, they are shown quite plain, but the intention is to cover them with lincrusta walton. As this may not be known, I may say that it is an embossed fabric somewhat resembling thin linoleum. It is principally used as a wall covering, but for decoration of a cheap kind it is admirable. The effect of a panel covered with it is very much like carving, and as the designs in which it is prepared are excellent it is superior in appearance to badly carved work. I shall, however, have more to say about lincrusta later on, but in the meantime I throw out the hint that it may be got through almost any high-class decorator.

The panels, whether plain or covered with lincrusta, should fit closely, and be fastened in with a few brads driven into the frame to prevent them falling out. Certainly a neater way would be to fix them in with small slips of beading, but this entails more labour, and so may not be judged necessary for such a piece of furniture. Still, for those who prefer this mode of fastening, Fig. 19, showing rail, bead, and panel in section, is given. The beading may be glued to the frame, but it will be better either to brad or screw it in case it should be necessary to remove the panel at any subsequent time for carving or other decoration. On no account, especially if the panel is not covered with lincrusta or something similar, glue it into the rabbet. If it is glued and the wood is not perfectly dry it will very likely split in shrinking. If unglued it will be able to "play" and contract without splitting.

When the door has been made it may be hinged, but as particulars of the whole of this part of the work will be fully treated in a separate paper it will be unnecessary to describe the operation in detail here. The size of the hinge is unimportant, but from $1\frac{1}{2}$ in. to 2 in. will be suitable, the "butt" variety being the proper kind. The door in mine has no fastening, as it is so hung that it keeps shut when closed, but of course a lock may be fitted if desired. "Cupboard" locks are the sort, one with "bolt shooting to left," and the other "to right;" but as lock fitting will come in in some other piece of furniture, description must be left for the present. To prevent the doors being forced too far in, a small block should be glued inside the cupboard. The block or stop will be more out of the way if fastened near the top, but if a lock is used perhaps the best place for it will be just behind the hole into which the bolt will shoot.

The shaped pieces placed at the ends of the overmantel and the small shelves have not been mentioned, but they require very little description. Like all the rest of the curved outlines, they were cut with a Britannia Company's No. 8 fret saw, and are of the same thickness as the ends. The only caution I would give is that the upright pieces should be long enough to fit closely

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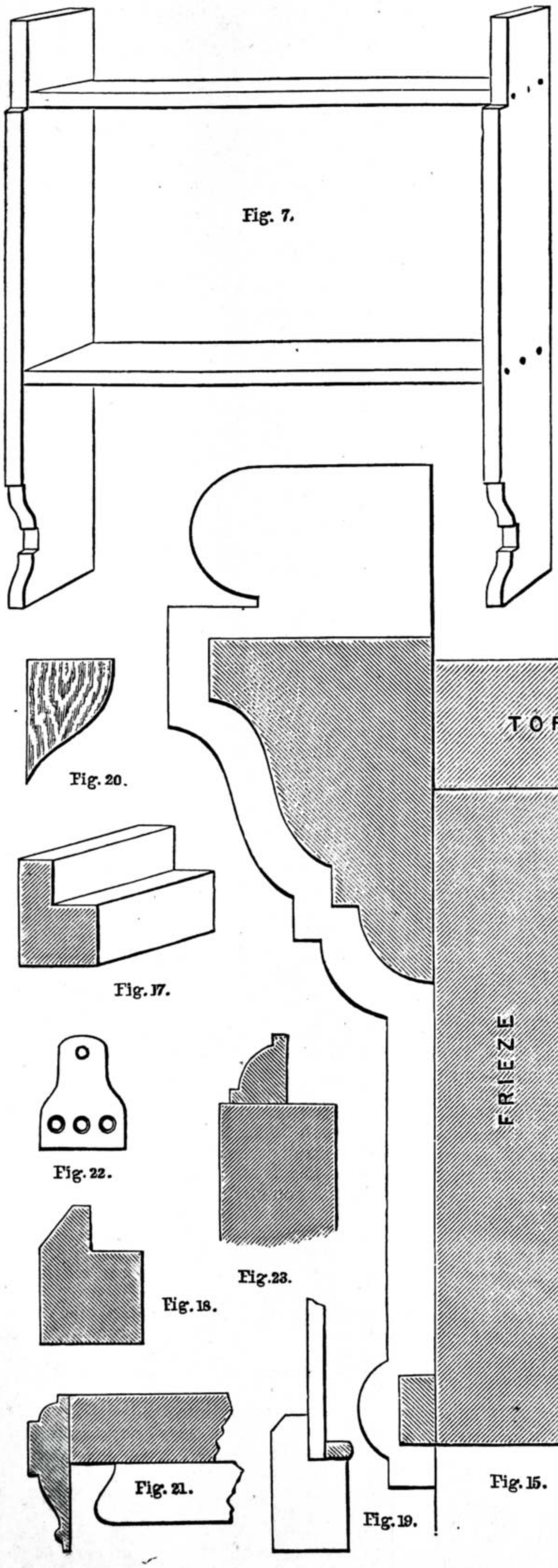


Fig. 7.

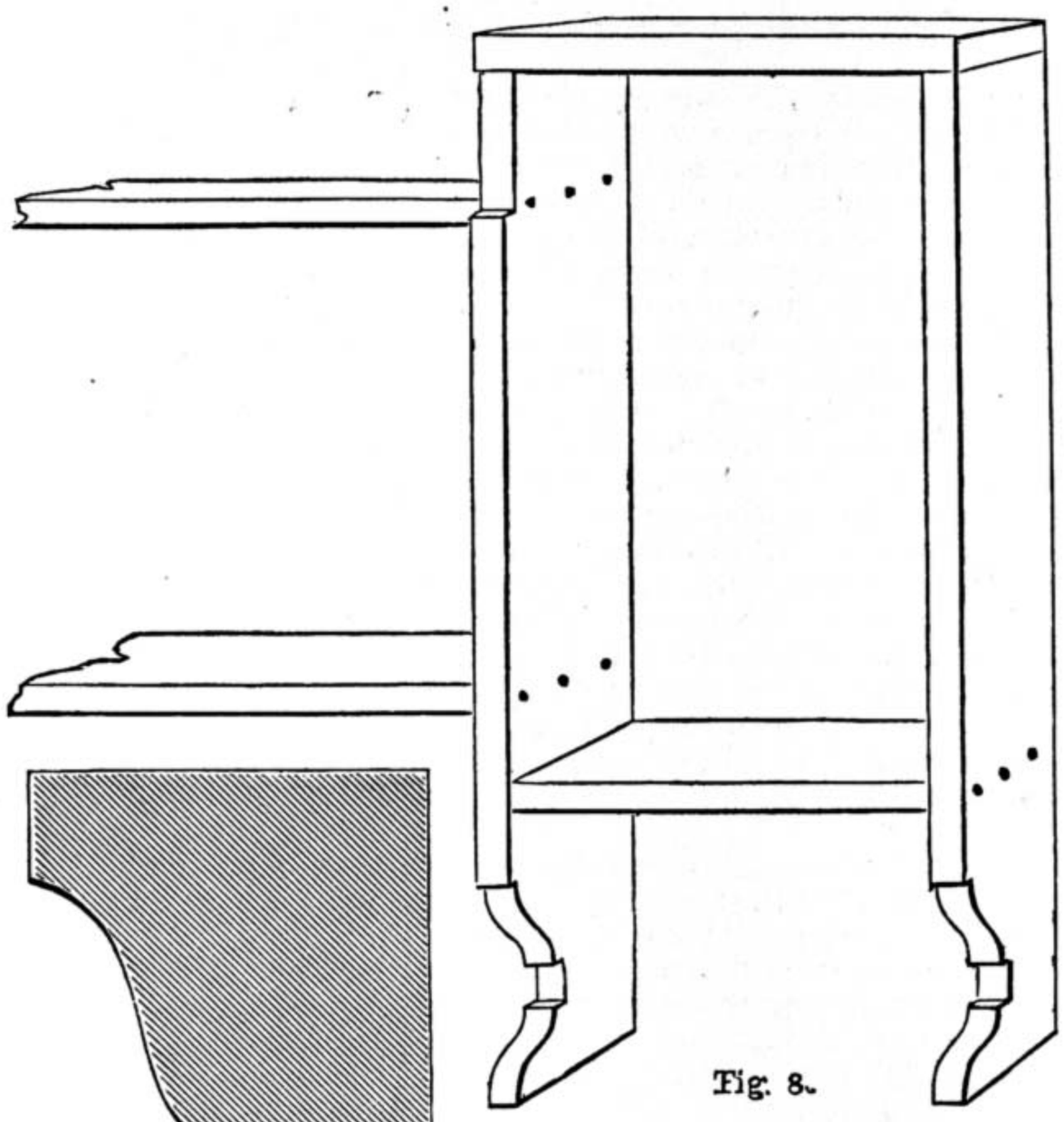
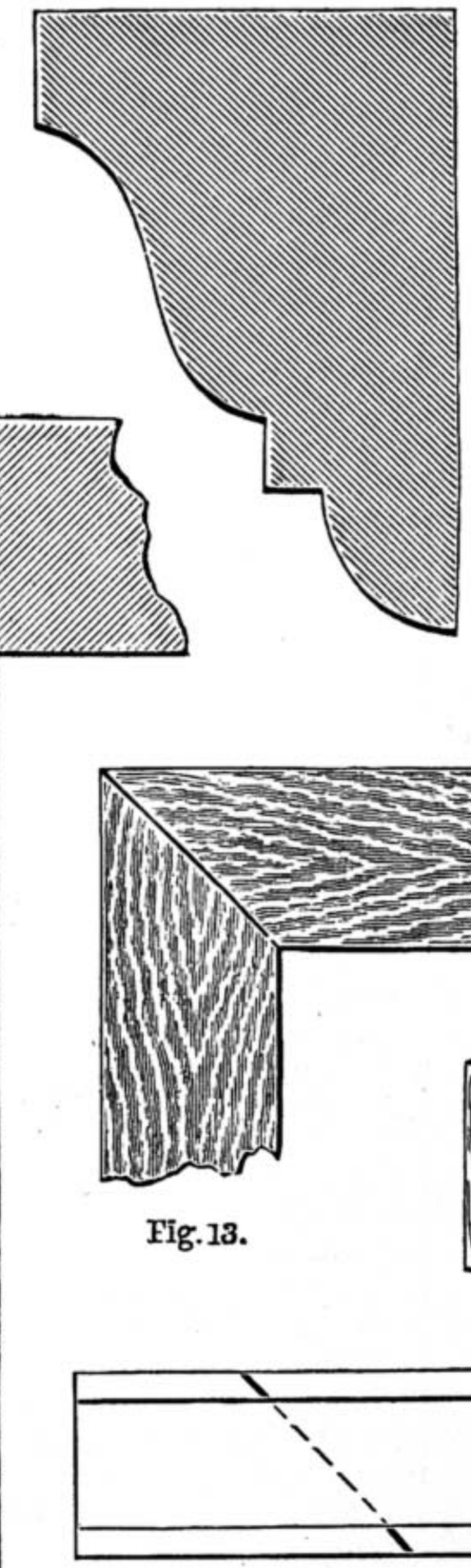


Fig. 8.

Fig. 20.



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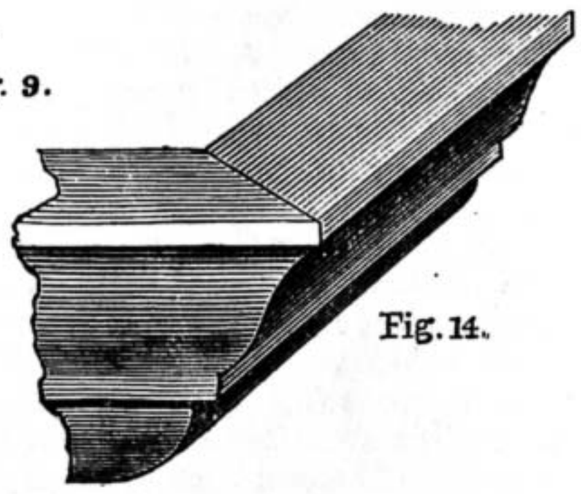


Fig. 14.

Fig. 17.

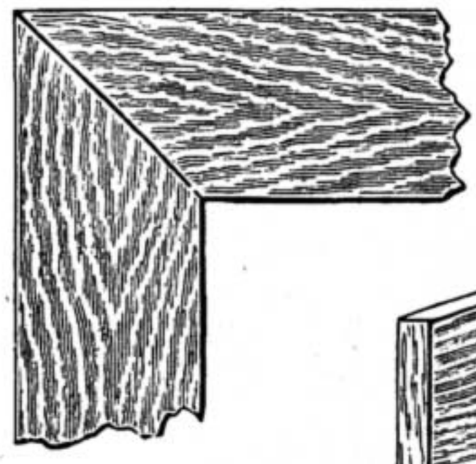


Fig. 13.

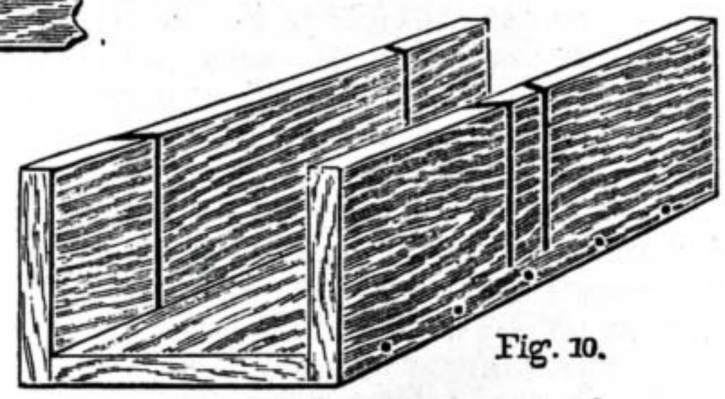


Fig. 10.

Fig. 22.

Fig. 23.

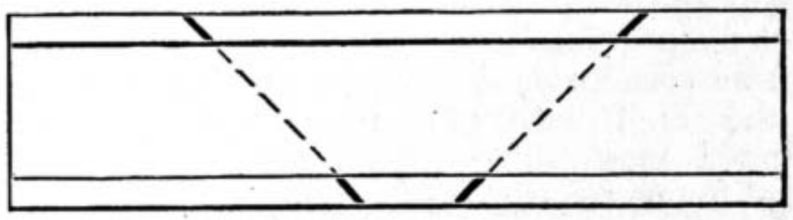


Fig. 11.

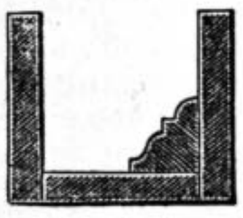


Fig. 12.

Fig. 18.

Fig. 21.

Fig. 19.

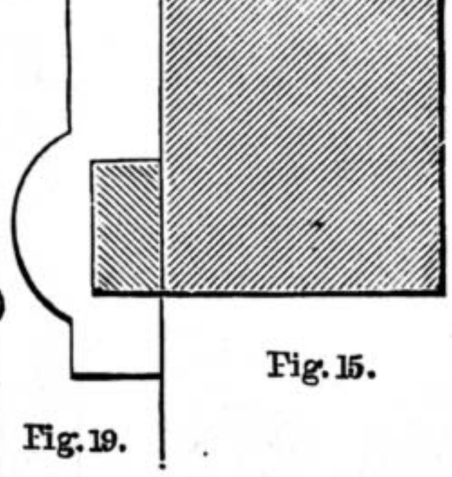


Fig. 15.

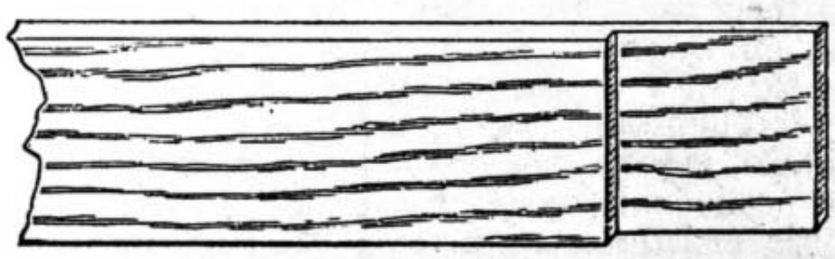
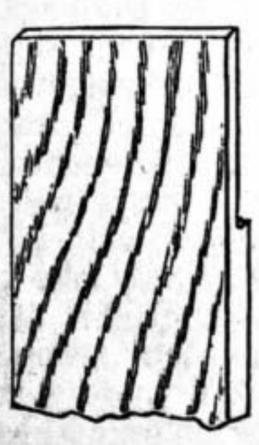


Fig. 16.



Artistic Furniture. An Overmantel with Cupboards: Details. Fig. 7.—Inner Ends with Shelf and Top. Fig. 8.—Ends of Overmantel showing Attachment of Shelves and Top. Fig. 9.—Section of Moulding. Fig. 10.—Mitre Box. Fig. 11.—Plan of ditto. Fig. 12.—Section of ditto with Moulding. Fig. 13.—Mitred Joint: Plan. Fig. 14.—Mitred Moulding. Fig. 15.—Facing Piece of End with Cornice. Fig. 16.—Construction of Halved Joint. Fig. 17.—Rebate or Rabbet. Fig. 18.—Bevelled Edge. Fig. 19.—Section of Rail, Panel, and Bead. Fig. 20.—Small Side Shelf. Fig. 21.—Bottom Board and Moulding Covering and Concealing Shelf of Mantel. Fig. 22.—Glass-Plate or Ear-Plate. Fig. 23.—Moulding.

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up to the piece at the lower edge of the frieze, and that they should be neatly tapered off to its thickness. The shelves are shaped as in Fig. 20. By screwing the shelves to the shaped uprights or side brackets, as they would probably be called by most cabinet makers, and then to the ends, it will only be necessary to drive a brad or two in through the upper part of the brackets to make the whole secure without any unnecessary display of nails. Of course, screws may be driven through the ends at the back of the cupboard into the brackets to any extent. The shaped pieces under the cupboards and at the top of the centre opening speak for themselves so far as outline is concerned. They may be of wood ¼ to ½ in. thick, but no object is gained by having them too stout. They are fastened by small blocks of wood glued to them and to the parts above them, as well as glued up themselves. A couple of brads are also driven through each where the wood is narrowest.

This operation completes the construction of the overmantel as it stands, the finishing having been given by painting with an enamel paint of a dark chocolate colour. That, however, is merely a matter of detail, as in the event of any one finishing the work with paint the surrounding colour should be taken into consideration, and it is almost unnecessary to point out that both bright and light-coloured painted furniture seems to hit the popular taste just now. A sufficient range of colours in enamel paints is to be had, so that the overmantel may be finished in almost any tint.

Leaving this, therefore, it will perhaps be more serviceable to describe how the back of the overmantel may be fitted either with glass, wood, or other panels. Perhaps before doing so it will be as well to advise that the overmantel instead of resting on the mantelshelf should rest on a board, which of course will cover the shelf. My own reason for using a board was that the shelf is shaped in front—serpentine, I believe, is the correct description. Now, however beautiful the curved line thus indicated may be to some, it certainly does not accord with such an overmantel as the present one. The wooden board, as it may really be called, covers the embodiment of the "line of beauty," which, however, I am afraid Hogarth would scarcely recognise as such. A moulding is planted on the front and ends of the wood, so that the original shelf is not seen. (See Fig. 21.) The moulding at the front corners is mitred, and is attached to the shelf with glue. Instead of a moulding I may suggest a fringe or mantel-frontal for those who like dust accumulators, though many of these frontals are so beautiful that one ought hardly to object to their use. Much, however, must depend on the kind of room the overmantel is for. In a work-room excess of drapery is objectionable, in a drawing-room tolerable, for it is elegant—no, that's not the fashionable word nowadays; call it rather artistic or æsthetic. Any way, the reason I advocate a wooden shelf is that it gives a finish to the overmantel, and on some future occasion I hope to prepare a woodmantel to complete the fireplace, and as soon as the design is ready I shall be pleased to describe it in WORK.

In ordinary circumstances no fixing will be required for an overmantel such as the present. The shelf is laid on the mantelpiece, and above it the overmantel. If, however, it is necessary to fasten it to the wall it may easily be managed with one or two glass-plates. These are made of brass, shaped as shown in Fig. 22, and owe the perhaps rather misleading name by which they are generally known to the fact that they are much used for fixing chimney glasses to walls. They are obtainable at most furnishing ironmongers. To use them, screw the broad part of the plate to the back edge of some part of the article so that the smaller end is uncovered. The plate then lies flat against the wall, into which a nail is driven through the remaining hole in the plate. It is just as well to keep the plate or plates as near the top of any overmantel they are used to hold to the wall. In the present one the most suitable place seems to be at the back of the tops of the cupboards, one to each if two are used, or if only one then at the back of the top centre board. The plates will, of course, be fixed so that they are upright, projecting above the tops, as the nails into the wall can be more easily placed than if the plates hung downwards. Like many others, however, this is a detail which can only be generalised on, and enough has been said to enable any one to do what is necessary.

Lastly, let me say if glass is desired behind the overmantel, or, to put it more widely, if the wall behind the overmantel is to be covered, some sort of rebate must be made for the glass or wood panel to fit into. A frame, similar to that for the doors, may be made to fit into the spaces, and either glass or wood let into them. A simpler way, however, will be to get some small moulding, such as shown in Fig. 23, and glue it round the openings, leaving just such space behind as will form the necessary rabbets. It must be mitred at the corners, and besides forming a rabbet will have a suitably decorative effect. No backs will be required for the cupboards as the wall closes these behind. I trust I have now shown sufficiently and clearly how a useful piece of furniture may be simply made from such unpromising material as an old packing case, and if it may seem that the instructions are lengthy, let me say that as many of them are applicable to the construction of the remaining articles of the same kind which are projected, and will be described in following parts of WORK, it will not be necessary to repeat them. It will be taken for granted that those who wish to make any of the other things which will be described have read the present directions. This will prevent a lot of recapitulation, and allow succeeding articles to be briefly treated, only details of any operation not necessary in the overmantel being subsequently described. Possibly by the time we have done the novice now may find that he has gained a very fair idea of general construction as applied to wood work.

PHOTOGRAPHIC NEGATIVES:

Their Reproduction and Multiplication.

BY L. IVOR POOLE.

IN connection with my business, which, I may say, is not photographic, I find it convenient to resort to photography occasionally. As the prints are sometimes wanted in large quantities, that is to say, a few hundreds from the same negative, some speedier method than that of printing one at a time naturally soon suggested itself as desirable. In other words, I wanted to print several from the same negative—a negative which should be a reproduction of the original. As the pictures are mostly small, it occurred to me that, by reproducing the negative several times on the same plate, not only might the plates be economically used, but several prints might be got on the same piece of paper—*i.e.*, instead of arranging the printing frame for each picture, and so losing much time, a number of prints might be got at one operation. I may say that for my purpose it is not necessary that the prints shall be first-rate specimens of photography, or that they are all printed and toned equally. In fact, not to make any mystery about it, they are required for advertising purposes. What they show or advertise does not matter, but having explained what they are wanted for, any business man will readily understand that economy of production, both as regards time and money, is essential.

Well, seeing that the desirability of producing them quickly and cheaply was so great, I made various inquiries. Whether these were wrongly directed I do not know, but it is certain I could get no satisfactory explanation of any process that would suit. I was recommended to try the various quick printing processes, but none of them, either owing to difficulty or expense, came up to my requirements, and I could get no information how to reproduce negatives easily and quickly. The thing seemed to be a very simple matter, and doubtless would have proved so in the hands of an expert photographer. Even to me the work was very simple in theory, but in practice the failures were more than I care to contemplate, though why should it be so? If a certain road is paved with good intentions, the road to success is marked with failures which serve as finger-posts directing onwards. This was how I worked my theory out—not an original one, no doubt. If a positive could be printed from a negative, could a negative not be printed from a positive? Certainly. Could not such a reproduced negative be used to print other positives from? Again, certainly. Further, could not several negatives be made on the same plate, just showing what was required, and leaving the superfluous margin out? Yes; it seemed easy, but I was a long time before hitting on a satisfactory method.

At last, after many trials, I did so; and the result is that, instead of printing each photograph separately, when I want a number of any I reproduce a number of small negatives on one large plate. For example, just in front of me as I write is a "whole plate," containing fifteen facsimile negatives, not, perhaps, all quite so brilliant as the original from which they are reproduced, but sufficiently good. The consequence is that it is only necessary to put one piece of the sensitised paper in the frame and fifteen photographs are printed on it. These fifteen are afterwards easily separated with a pair of scissors.

Without going into the details of the various methods I have tried and discarded as being unsuitable from one cause or another, I may describe the process I adopt now, as it may not only be useful to others who are experimenting in the same direction, but may give them hints which will enable them to improve on it. If they do, perhaps they will give us the benefit of their experience in these pages, which no doubt will be open for any hints based on work actually tried. The notions may be crude, and the methods apparently self-evident, but some of us want a good deal of assistance even in such, and

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for the sake of us "duffers" I take the liberty of hoping that any particulars likely to be of use will not be withheld by our more skilful brethren. This will partly explain my presumption in explaining what, for want of a better title, is called the reproduction of negatives; and now I may remark that though I have said several of these are wanted on the same plate for my purposes, the same principle may be applied to the reproduction of a single negative.

This reproduction, it will be understood, may be useful occasionally when the original negative has been destroyed before a sufficient number of prints have been taken; and, as a matter of fact, I believe some such method is followed when it is not convenient to reproduce by a camera. I suggest this, as one evening lately, when I was preparing a quantity of negatives on the same plate, a friend who was with me happened to mention that he had destroyed a plate after having only got one print from it, although several were desired. My work gave him the necessary knowledge how with his own print he could reproduce any number. From my original negative, or rather from the part of which I want to print a number of copies quickly, I take a sufficient number of prints on the ordinary silver paper.

For instance, not to specify the things shown on my photographs, let us suppose that it is desired to reproduce one head only from a plate containing a group of several people. A piece of the sensitised paper is placed behind this head, and exposed in the regular way. The depth to which the printing is done must depend on circumstances, but, as a rule, better results are got from prints not quite so dark as those which are printed for toning. I aim at getting prints of much the same depth as if they were toned; that is to say, they are not printed darker than a finished photograph would be, no allowance having to be made for lightening by toning and fixing. These prints certainly may be toned and fixed in the usual manner, but these operations only needlessly complicate the work, for no one will need to be told that it is much more difficult to get a batch of photographs finished exactly to the same depth and shade than merely to print them equally.

Of course, when the prints thus produced are taken out of the frame they are kept in the dark till they are wanted, and light being kept from them, they retain their colour well enough to serve their purpose for some time. When a sufficient number of them are ready, their edges are cut and trimmed, each piece of paper being cut accurately so that they may fit well together. They are then stuck to a piece of glass, usually a spoiled negative, with the film washed off. This glass serves merely as backing to hold them flat during the printing of the negative. The prints need not be stuck down all over, as a small touch of some adhesive material—strong gum, or, what I generally use, glue—on each being sufficient. As the printed side must be uppermost, the plain side of the paper is stuck to the glass; and as the glue, or whatever is used, has the effect of increasing the density of the position, or, as it may now be called, the negative, *pro tem.*, at that particular place, it should be applied just behind the darkest part of the print. If this be done it will scarcely leave a trace on the subsequent negative.

When the prints are all fixed to the glass, this is placed in an ordinary printing frame, and the reproduced negative is taken from it. I proceed as follows, all this part of the work being done by gaslight, which not only allows me to utilise spare time in an evening, but is more reliable than daylight. The time for the exposure having been once ascertained with the artificial light, no guess work or calculation is required, as it would be with the variable shades of daylight. I always expose for these negatives with one particular light, so that making very slight allowance, according to the depth or thinness of the positive, the precise time for the exposure can be told to a nicety.

As some guide for others, I may say that I print under a common "pendulight," with a white shade over it. The frame during exposure lies on the table underneath, at a distance of, say, twelve inches from the flame. Time of exposure under these conditions is about thirty seconds, with a variation of five seconds, more or less, according to the density of the (positive) negative, for Eastman's negative paper and ordinary Ilford's. With the gas out, and by the aid of the ruby lamp, the plate or paper is arranged in the frame, which is then placed back upwards on the table till the gas is lighted, when the exposure is made as already described. The plate is developed afterwards in the ordinary way. It will then be seen that on the one plate the original negative has been reproduced, and by putting it in a frame with a sufficiently large piece of printing paper, the saving of time and trouble in producing prints must be manifest.

As a rule, I use whole plates for reproduction, but of course there is no limit to size. I do not separate each print at once, but tone and fix first, washing, etc., as usual. The backs of the sheets are then gummed over and left to dry, after which they are stored away, and the separate photographs cut off with a pair of scissors as may be required. There is then no more trouble in affixing them to their mounts than if they were so many postage stamps. Of course, gum could not be safely employed if the photos were intended to be durable, but for the purpose they are intended for it answers very well. The use of paper negatives has been alluded to. I use Eastman's, but no doubt any other kind would do, and I much prefer them to glass for this kind of work. For example, when an unusually large number of photographs is wanted in a hurry, several sheets of the paper negatives can be stuck on one piece of glass, if necessary as large as a full sheet of the silvered paper. The paper may seem to militate against speed in printing, and no doubt it is a trifle slower than glass negatives, unless these be rather dense. A well-prepared paper negative, free from stain, however, prints with a rapidity when its opacity is reduced by oiling, which may seem remarkable to those who have not tried them.

Perhaps something ought to be said about this oiling and sticking to the glass, though this latter is only necessary in the case of very large negatives, say when more than one sheet of the negative paper is used in the same frame. One negative sheet may be simply placed on the glass, to which it need not be stuck in any way. For the oiling, almost anything greasy may be used. There is a stuff, a preparation I believe of vaseline, called "translucine," which is recommended as specially applicable, but never having tried it, I cannot speak positively of its merit. Melted paraffin is not a bad substance, but I always use something more easy. To touch on everything that I have used would be to give a tolerably long list of oleaginous substances. I will content myself with mentioning two or three. Castor oil is—apart from its smell, and, I may add, its taste—a favourite. It penetrates the paper well, and is colourless, the one quality reducing the granulation which is often noticeable in prints from paper negatives, and the other not hindering rapid printing. Vaseline is also good, but its slightly yellow colour is not always convenient. Butter has been employed when nothing else has been handy, and I am not sure that it does not do as well as any of the others.

Whatever may be the oil or grease used the paper must be well saturated with it, and sufficient time given to allow it to soak in. By degrees, some of the oil evaporates, and the negative, instead of being clear all over, becomes patchy, some parts or spots being more opaque than others. The remedy, of course, is to re-oil. I give a liberal quantity of oil, and rub off superfluity with a soft rag, being specially careful that none remains on the film side of the negative, as, of course, this is next the silvered paper, which, if not spoiled, would not, at any rate, be improved by grease.

When the newly produced negatives require to be stuck to the glass, which, as I have said, is only necessary when several of them are used in one frame, I do not stick them down all over, but just sufficiently to keep them in position. Glue or paste, of course, does not adhere properly to the greasy negative. This generally can be arranged with a margin round it or on one side, and some strong adhesive material may be used, but I find it very much simpler to use pieces of postage-stamp margins, part being stuck to the glass and part to the negative. It sticks well to the gelatine film, and if necessary can be easily removed by damping. As, however, one or two small pieces only are required, the negative can simply be torn away from the glass, and fastened down with fresh stamp paper a good many times without any necessity for damping.

I should not omit to mention that instead of silver prints for the preparation of the reproduced negative, prints on the Eastman film may be taken, and the multiplied negatives taken from them. The other operations are identical, and though this rough-and-ready way of practising photography may not commend itself to the "artist" photographer, it will no doubt be of some use to those who, without requiring perfect reproductions, wish to have them quickly and in quantity without much expense.

A SIMPLE CEILING IN WOOD.

With Hints for Wall Panelling on the Same Plan.

BY HIRAM PRICE.

I.—Ceiling with Longitudinal Arrangement of Mouldings.

In common, I presume, with many to whom this periodical promises to be a boon, I am accustomed to do many things which people generally consider it necessary to pay other men to do. Wishing to have a house of my own, and one after my own mind, I have constructed a dwelling without employing either architect or builder. With a bricklayer and a carpenter acting under my own directions and supervision, I have raised a structure which thus far answers satisfactorily all the requirements of a home,

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and one, moreover, which embodies most of my own theories and views with regard to domestic architecture. Its fittings are mainly the work of my own hands. In a house so built, I make no question but that there must be many features which would have an interest for the readers of WORK. That feature, however, which just now I desire to bring under their notice is the peculiarity that throughout my dwelling no plaster whatever has been used. I object to plaster. It is in my opinion at the same time a costly and an unsatisfactory thing, as well as being a material in which an unprofessional workman like myself does not care to dabble.

Now with walls there are abundant ways of dealing to the exclusion of plaster—you may batten and paper them, you may panel them, you may hang them with tapestry, or with pressed and moulded bricks laid carefully and neatly; you may, for certain purposes and situations, make the inside surface of your wall sufficiently pleasing to the eye to be left uncovered. There are such uncovered walls, relieved by ornamental brick mouldings, in my house. But, in the case of ceilings, one has fewer resources at one's command, and how I dealt with mine may be worth describing.

As I proposed to make an ornamental feature of my joists, I had them planed and stop-chamfered before being placed in position, and upon these the flooring boards were afterwards laid in the usual manner. My flooring boards were, as is customary, planed on the upper surface only, and left rough below; consequently, when nailed down by the carpenter, they presented anything but a pleasing sight to the spectator when seen from beneath. To do away with this unsightliness, and render my ceiling decorative, I proposed to veneer, if I may so use the term, between my joists with a second thickness of boarding which should be planed and finished.

In thus using thin board I knew that I should have a difficulty to contend with in the tendency common to all new timber used in a house, and which in thin board especially shows itself—that, namely, of shrinking whilst drying, and thereby causing the formation of ugly chinks; or, if so fixed as to be prevented from shrinking freely, of cracking and splitting. How I overcame this difficulty may be seen at a glance by reference to Fig. 1, in which is drawn a section of the floor and ceiling. The arrangement there shown has enabled me to avoid betraying any chinks, and to keep my wood from much danger of splitting.

The spaces from joist to joist which had to be covered were 15 in. wide. For each space I provided two 7 in. widths of planed ½ in. board; and laying them close to the joists, I secured them to the flooring above by screws driven 1 in. from the joists and a foot apart. These screws are shown in Figs. 1 and 2, and are marked *a*. A space

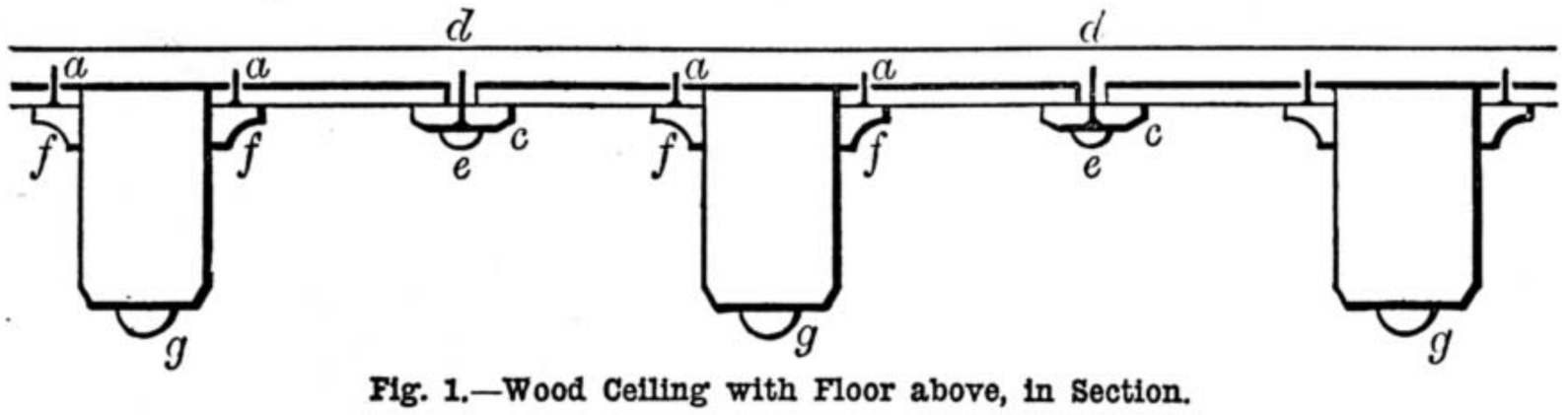

Fig. 1.—Wood Ceiling with Floor above, in Section.

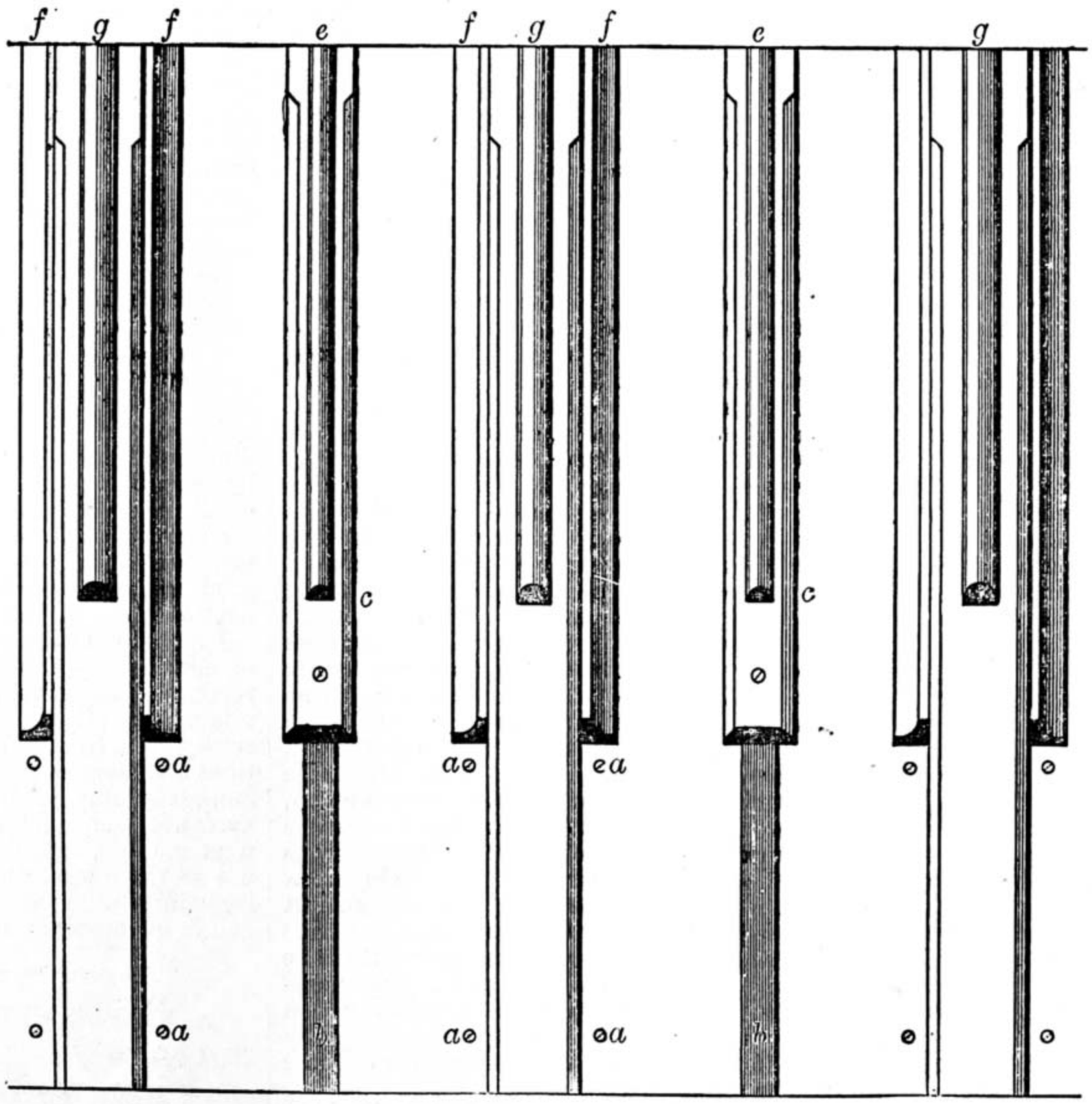

Fig. 2.—Wood Ceiling with Floor above, in Plan.

of about an inch (indicated by *b*, Fig. 2) was left between my two boards, and this I covered by the strip of moulding marked *c* in the last-named figure, and also indicated by the same letter where seen in section in Fig. 1. This strip was 2 in. wide and an inch thick, and was fastened by screws to the flooring above. These screws, as shown in *d*, Fig. 1, were driven through its centre, and not, be it remembered, through its edges where they overlap the veneering boards. The object of this will be apparent—it is desired to *support* the edges of those boards without absolutely *fixing* them, that, thus being attached on one side only, they may have liberty freely to expand or contract with the alternations of damp and dryness, heat and cold. The most ordinary cause for the splitting of boards is thus avoided.

By this strip of moulding I hid the opening between the two boards, and I rendered the strip more ornamental, whilst at the same time I covered the screws which secured it by the piece of half-round beading (*e*, Fig. 1) which I fixed along its centre with needle points. The same beading is also shown under the same letter of reference in Fig. 2.

To cover the screws which fastened the veneering boards, and further to add to the enrichment of the ceiling, I then ran a strip of hollow moulding along the angle formed by the joist and the veneering board (*f*, Figs. 1 and 2), fastening it to the joist with needle points. Lastly, I gave a finish to the under surface of my joists by running a half-round moulding, similar to that before named, along their middles (*g*, Figs. 1 and 2), and fixing it in the same way.—N.B. Needle points are, for such purposes as this, far preferable to brads, as they can be broken off level with the surface of the moulding, and are practically invisible. Of course it is only for very light work that they are available.

For my own ceiling, I used only yellow pine and red deal, and these were merely stained and varnished. But I gained a certain amount of relief by staining some of my mouldings of a deeper shade than the general tone. I would, however, suggest that there are two ways in which a ceiling thus constructed might be made to give scope for considerable decorative taste: either by using woods of different and ornamental kinds in the veneering boards, mouldings, etc., or by the application of paint and gilding.

To a man handy with carpenter's tools, but not with the brush, the first method would no doubt chiefly recommend itself; and by a judicious selection of woods, in which colour and shade were well contrasted, a good effect might be produced. But the woods would be costly, and mouldings in such woods are not kept in stock by those who sell such things, and would have to be specially struck, which would cause additional expense.

To any one more at home with the paint brush, the second plan may seem the better:

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it would cost less and be more effective. For such a purpose a good deal of bright and positive colour might be employed. On a ceiling brilliant colouring can be used more freely than on a wall. On the latter anything very pronounced looks crude and vulgar, because the eye is constantly resting upon and criticising it. But at a ceiling we rarely look directly; at most times we have but an indistinct sense of its existence; and to derive pleasure from any ornament upon it, our perceptions demand that that ornament should be pretty boldly made out. I am not, however, prepared to offer a scheme of colour for such a ceiling, and am now throwing out suggestions merely. My own wooden ceilings were merely stained and varnished.

In one respect I must admit that my work has not given me complete satisfaction: my ceilings transmit sound too freely. Now, this is a disagreeable, though, perhaps, scarcely to be called a serious, defect; for, without being a conspirator or murderer, one may have matters to talk over in one's house which it is not expedient to have heard by every person who may happen to be on the floor below, or the floor above, as the case may be. We like to feel sure of our privacy. Nor does any one feel at ease when he knows that every little sound he makes in moving about his bedroom—harmless as those sounds may be—is distinctly audible to those in the room beneath. Moreover, like thin partitions, floors which transmit every trifling noise are too much associated in our minds with cheap jerry-built houses to be ever altogether pleasing to us. I must own this defect to be a weak point. Yet I can now see how easily this inconvenience might have been avoided, and have a suggestion or two to offer on the subject for the benefit of any person who is inclined to ceil his rooms after my method. Sound might to a great extent be deadened by the simple and easy precaution of putting felt between the two layers of board; an inodorous felt of course to be used. Two or three thicknesses of the paper felt used for laying under carpets would, I imagine, be cleanly and effectual for the purpose. A felt in which the fibre is woollen is no doubt a more decided non-conductor of sound, as well as of heat, than one in which the fibre is vegetable, but it has disadvantages in other directions; and though I do not speak on this point from experience, I should say that a paper felt would be best for the present work.

Or, in case the worker prefers to cut off sound in a more thorough and substantial manner, he might adopt some such plan as that shown in Fig. 3: a space (*h*, *h*, *h*) might be arranged between the two layers, to be filled with some non-conducting substance, such as pugging or sawdust. Pugging—a rough mortar, that is—when thus used in Scotland is emphatically termed "deafening," and admirably answers the purpose of intercepting sound; it also goes far towards rendering the floor fireproof. It, however, weights the joists heavily. Sawdust, which is light, will to a great extent answer the purpose of a non-conductor of sound, and might, by putting a little powdered alum with it, be rendered fireproof. This would be adopting the plan employed in the packing of fireproof safes. Alum, it will be remembered, holds a large percentage of water in suspension, which, at a high temperature, it gives off in the shape of steam. Hence alum holds towards fire very much the attitude of a dog in the manger—it will neither burn itself nor let anything near it burn.

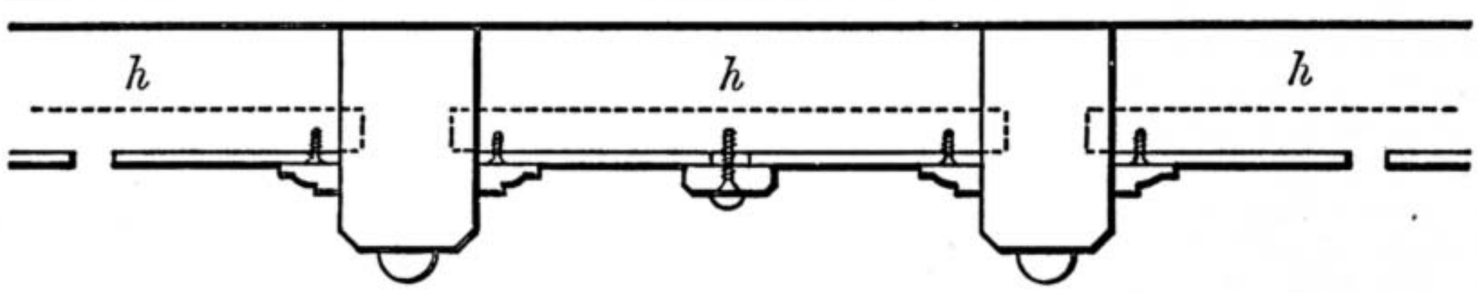

Fig. 3.—Wood Ceiling. Section, showing Space contrived under Floor for Packing.

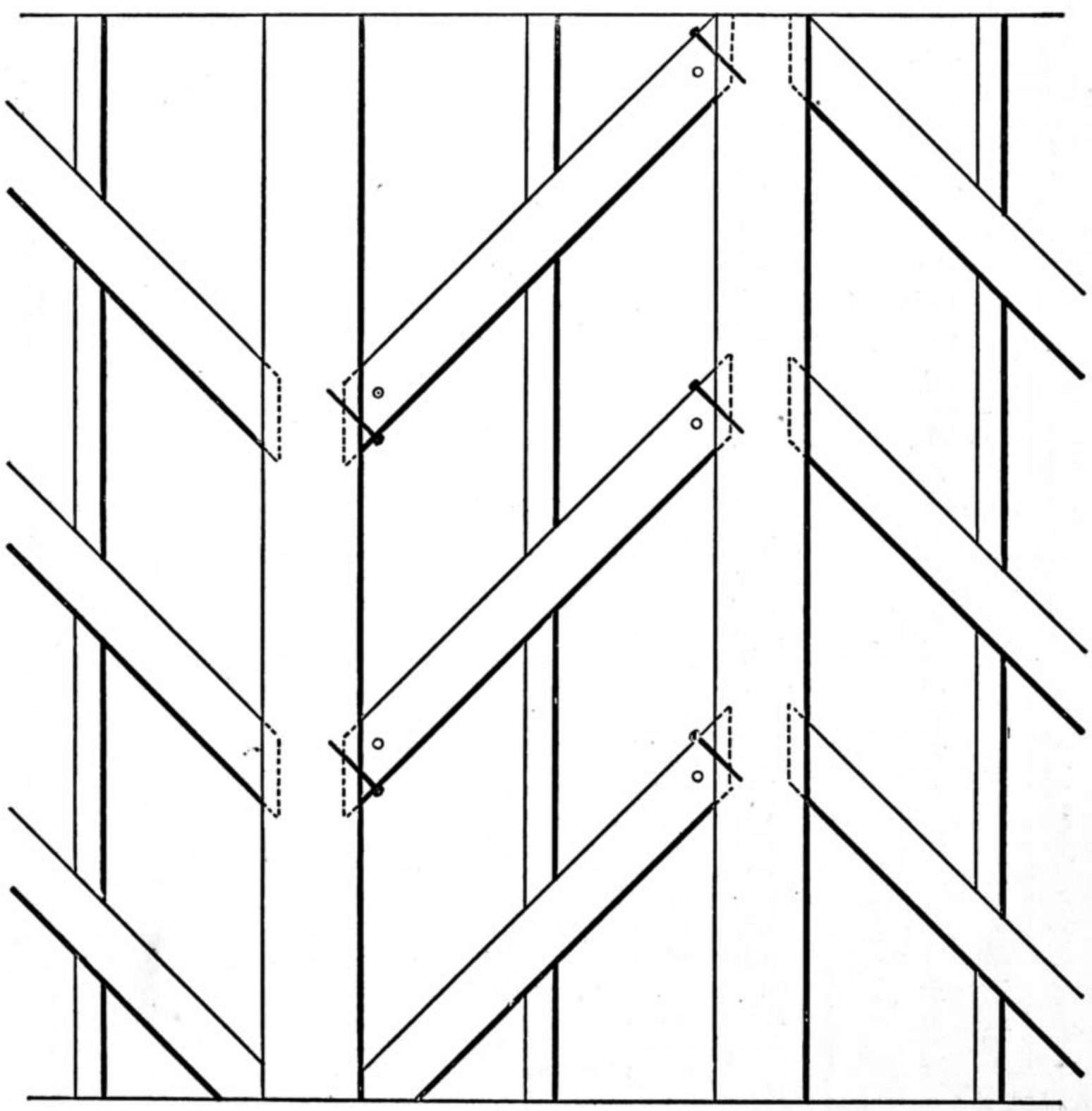

Fig. 4.—Wood Ceiling. Plan, showing Alternative Arrangement for Support of Veneering.

It is said that the discovery of this property in alum is due to a certain observant individual who was roasting a pinch of it in an iron spoon as a remedy for a gum-boil from which he was suffering. Fortunately, his pains were not so acute as to prevent his remarking and speculating on the curious anomaly that this seemingly dry substance should, when heated, become moist, and exhibit all the characteristics of a moist substance. He reflected that if heat, which renders most things dry and inflammable, caused this to grow wet and to damp everything around it, it must needs be valuable as a fire resister. After experiments proved his conclusions to be correct: and alum has been used not only for admixture with sawdust in the packing of fireproof safes, but as a means of rendering fireproof a variety of inflammable materials, more especially the flimsy textile fabrics sometimes used for ladies' dresses. It is unroasted alum which has this property; by burning or roasting it all water is expelled, and it is thus rendered useless as a safeguard against fire.

This is a digression; but any means of guarding against fire are so important to all interested in building houses—and for that matter, to all interested in living in houses when built which includes a moderately large section of the public—that any apology for it can scarcely be needed.

Should the pugging or sawdust arrangement be adopted, the packing must of course be done before the flooring boards are laid, and the veneering boards and mouldings must be supported in some such manner as is shown in Fig. 4. Laths may be nailed diagonally at the proper height, from joist to joist, or, as there indicated, greater solidity may be attained by mortising them into the joists, and to these laths the veneering boards and mouldings are to be screwed.

In Fig. 4, an alternative arrangement for support of veneering, the ceiling is supposed to be seen from above before the flooring boards are laid down.

Thus far I have spoken of my simplest arrangement of wood work only; in the second part of my subject I shall deal with certain decorative arrangements which are somewhat more elaborate, with the application of the same kind of wood work to wall panelling, and some allied matters.

(To be continued.)

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THE BUNSEN BATTERY.

Its Construction and Application.

BY GEORGE EDWINSON BONNEY.

III.—CONSTANCY OF THE BATTERY.

THE following table (from the *Electrical Review*) shows the constancy of the Bunsen battery. The experiments, which led to the results herein tabulated, were performed with one pint size cell of the Bunsen battery, or, rather, with two such cells, one of which was charged with nitric acid (specific gravity, 1·35) in the porous cell, and the other with the ordinary bichromate of potash solution in the porous cell. The outer cells of both were charged with a solution of dilute sulphuric acid (one part of acid to twelve parts of water) in each cell. Each cell was short-circuited through a wire connecting the zinc and carbon, the resistance of this circuit being 1·05 ohms. The cells were charged with their solutions one hour and three-quarters before the first test was made. The constancy of the Bunsen, when charged with nitric acid, should be noted and contrasted with the rapid failure of current when charged with the bichromate solution. During a working day of nine hours the first shows a vigour equal to its strength at the end of the first fifteen minutes, whilst the second shows only a fourth of the vigour exhibited at the end of its first five minutes.

TABLE, SHOWING CONSTANCY OF BUNSEN BATTERY, AT TIMES AS SPECIFIED FROM STARTING :—

After working	Nitric Acid.			Bichromate Solution.		
	E.M.F. in Volts.	Current in Ampères.	Internal Resistance.	E.M.F. in Volts.	Current in Ampères.	Internal Resistance.
			Ohm.			Ohm.
	1·71	1·21	·35	1·83	1·22	·45
5 minutes ...	1·70	1·21	·34	1·40	·90	·50
10 „ ...	1·69	1·21	·33	1·32	·86	·48
15 „ ...	1·69	1·20	·34	1·29	·86	·45
30 „ ...	1·69	1·21	·33	1·24	·82	·46
45 „ ...	1·68	1·21	·33	1·20	·79	·47
1 hour	1·69	1·23	·32	1·17	·79	·43
1½ „	1·68	1·24	·29	1·13	·76	·44
2 „	1·69	1·25	·29	1·10	·74	·43
3 „	1·69	1·26	·28	·99	·67	·42
4 „	1·68	1·26	·27	·90	·60	·45
5 „	1·65	1·23	·28	·76	·49	·50
6 „	1·64	1·22	·28	·61	·37	·60
7 „	1·64	1·21	·29	·48	·29	·60
8 „	1·64	1·21	·29	·43	·25	·67
9 „	1·63	1·20	·29	·41	·23	·73
11 „	1·60	1·17	·30	·35	·20	·70
22 „	1·45	·91	·53	·31	·17	·77
23 „	1·36	·83	·46	·31	·17	·77
24 „	1·17	·73	·54	·31	·17	·77
25 „	1·02	·63	·56	·31	·17	·77
26 „	·90	·55	·57	·31	·17	·77
29 „	·43	·25	·66	·31	·17	·77
30 „	·42	·24	·69	·31	·17	·77
31 „	·41	·23	·72	·31	·17	·77

If larger cells had been used, the internal resistance would have been reduced, and, if a stronger solution of sulphuric acid had been used in the outer cells, the E.M.F. would have been higher in each case. This would have given a stronger current. The results are most satisfactory, and should be carefully studied by all who wish to employ a powerful and constant battery.

The author concludes his short article with the following words :—"The nitric acid cell is far superior to the chromic, as far as the work is concerned, and, if it were not for the disagreeable and unhealthy fumes it gives off, would be used in nearly every case."

The above table will, I think, be found to be a valuable appendage to the remarks I have made in the preceding papers on the construction and application of the Bunsen battery. The papers themselves have been written with the view of affording assistance alike to the young electrician who has not been at work long enough to gain the experience which time and observation alone can bring, and to the amateur who may be attempting to make and work a battery perhaps for the first time. Should any readers need advice or assistance, I shall at all times be ready and happy to give it them through the medium of "Shop."

CRYSTOLEUM PAINTING.

BY O. BECKERLEGGE.

I.—INTRODUCTION—COLOURS—BRUSHES—GLASS—CHOICE OF PHOTO—REMOVAL FROM CARD—CORN-FLOUR PASTE—TREATMENT OF PHOTO—SHIFTING—REMOVAL OF SPECKS—THINNING PHOTO.

THERE are but few arts that are almost purely mechanical which yield such artistic effects as the one now about to be described. Like many other tricks and notions it is not of English birth, yet it can be easily practised by any one with the smallest amount of art instinct. It is in no sense a fine art, yet at the same time by it really beautiful and artistic-looking work can be produced.

In the hand of the artist photography readily lends itself as a foundation both for oil and water colour painting, but to lay colour on the photograph to produce a good effect requires the skill of a trained hand and great judgment. During the last few years a modification of an old art has come to us from over the sea, which has been improved upon by successive individuals until now it is so simplified that any one with an appreciation of colours can almost rival in effect the beautiful ivory paintings of our grandmothers' days. Moreover, it is one which can be learned almost as easily from reading as it can by seeing it done, and this, I presume, is the reason of its popularity. I learned the art in this way, and although I have the advantage of a knowledge of mixing colours and using the brush, yet I was surprised at the simplicity and rapidity of the operation. And to those who have not an intimate knowledge of colours, I think I can give such explicit directions that their want of knowledge shall prove but little hindrance.

Before commencing work we must supply ourselves with sundry requisites as follows :—

Glasses, two for each picture.
Paint, oil in tubes.

Cobalt.	Carmine.
Vandyke Brown.	Rose Madder.
Burnt Sienna.	White.
Naples Yellow.	Black.
Indian Yellow.	Vermilion.

And any other colour that any particular subject, such as landscape or drapery, may require.

Poppy oil.

Two or three brushes. They need not be sable—though for oil painting these are best in a general way—but fine hog would perhaps be equal to our work.

And last, though not unimportant, the subject to be worked on. The glass must be selected according to the subject chosen. Glasses can be procured as follows :—

Locket size, 3d. per pair.
Brooch size, 6d. per pair.
Carte de Visite, 6d. per pair.
Cabinet, 9d. per pair.

Larger sizes up to 10½ and 8½ in. varying from 1s. to 3s.

Round 3½ in., 8d. per pair.
Round 4 in., 1s. per pair.

These and all other requisites can be obtained of Messrs. Reeves, 113, Cheapside, London. I have found him ever ready to oblige, and his materials are the best of their respective kinds. I mention this as for a while I did not know where the glasses could be obtained, and possibly there are others in the same condition of ignorance.

Some care should be taken in the choice of the photo. As a first experiment take a head—good size, strongly marked features, eyes well opened. There must be good half tone and modelling—that is to say, there must be good shadows, as they can only be supplied by the photo, and unless they are fairly intense the picture will appear flat and without character. Good and suitable photos can be obtained of Messrs. Reeves, varying in price from 6d. to 2s.

But we will suppose that we are about to use a carte de visite. In the first place give it a good licking—but perhaps you will not relish that ; if not, take a little benzole and wipe it over—this will remove any trace of grease. Place it in boiling water long enough to allow it to come off the card. It must not be pulled off until the cement is softened, as if in any way the photo is torn it is spoiled. Whilst your picture is soaking, boil a little corn flour. See that there is not a trace of lumpiness in it. It must be thoroughly mixed before the boiling water is poured on it. If there be any suspicion of lumps, you had better strain it through a piece of fine cloth.

Press the picture between blotting-paper. In the meanwhile thoroughly clean your glass and rub the concave side with your paste, also rub some on the right side of the picture. Now lay it on the glass, seeing it sets square. Place a piece of strong smooth paper on the picture, and with the thumb squeeze the paste out from between the picture and the glass, beginning at the centre and working towards the edges. A wooden presser or squeezer is recommended by some, but I have never used them, and never found the need of them. For a while there will be a danger of the picture shifting ; if it gets out of square it must be screwed around to its proper position.

Looking at your work in some lights you will find the picture covered with small silvery specks—these are caused by a want of contact between the picture and glass. These must be entirely removed. Perhaps you may find your work so dry that you will fail to remove them ; if so, place your work in a bath of warm water—not hot, else you may require a fresh glass. I have found a good soaking almost entirely remove the offending specks, and a few judiciously applied rubs with the thumb have completed this part of the operation. When everything up to this point is perfect, let it stand till next day, say, to get thoroughly dry.

We must now reduce the thickness of the paper, so as to secure transparency. Take No. 1 glass paper and gently rub away at the back of the photo, watching it very closely, as a scrub too many may destroy all the work. You will gradually see the picture growing more distinct, and on holding it up to the light will see where the thickness of the paper is uneven. Rub the thicker parts down so that there is an evenness all over the picture. When your judgment shows you that the paper is almost thin enough, take No. 00 glass paper and give it a few

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gentle rubs to take away the rough marks left by the coarser paper.

(*To be continued.*)

"TIPS" FOR TYROS.

BY OPIFEX.

2.—IMITATION OF WOOD CARVINGS.

OLD oak, or other carvings in low relief, may be very effectively and easily imitated, almost in facsimile, by the following process :—

Procure some "basil" leather, and wet it thoroughly in warm water, in which a small quantity of size or glue has been mixed ; wipe it as dry as possible with a cloth, then cut a piece sufficiently large to cover the carving, and allow a small margin ; lay it upon the carving, and press with the fingers all over, in order that the leather may take the shape of the carving as much as possible. Next, with a smooth-pointed tool made of bone—say the handle of a toothbrush, filed down till it assumes a blunt knife shape — go over the surface carefully, pressing the leather into all the interstices of the design, and smoothing the larger or bolder portions until you have succeeded in bringing out all details. Of course, this process can only be applied to carvings, etc., which are not undercut.

If the superfluous moisture has been removed from the leather in the first instance, it may now be easily taken from the carving without interfering with its shape, but if not, it must be left until partially dry.

When taken off, the leather should be placed in a warm place to dry thoroughly, when it will be found to be quite stiff, and may be coated thickly at the back with a layer of gutta percha ; or with the following mixture : pitch, resin, plaster of Paris, equal parts ; melt the pitch and resin together, and then stir in the plaster of Paris. If a small quantity of wax candle be added to the mixture, it will be rendered tougher.

The imitation may now be applied to the use for which it was intended, and if treated with dark distemper oak-stain, and oiled, will look wonderfully like genuine carved oak.

3.—REPRODUCTION OF MEDALLIONS.

Very handsome and highly artistic medallions, which are capable of being applied to many uses, can be produced from the paper replicas of relievo subjects, which are sold at about 1s. each, and which can be procured from most artists' colourmen, etc. Those used by the writer are manufactured by Monrocq Fres., Paris, and are chiefly facsimiles of famous classical heads — *e.g.*, Minerva, Achilles, etc. etc.

The reverse side of the paper medallion is used as a mould, placed face down upon a table, the edges resting upon four pieces of wood ; the edges are then built up by a strip of gutta percha, etc., to a depth of about an inch. Now mix in water fresh plaster of Paris which has been well dried in an oven to the consistency of thick cream, using about a pint of water, or more than sufficient to fill the mould ; see that it is kept well stirred until it is perfectly mixed, and then pour into the mould to a depth of about half an inch at the edges.

The plaster should be carefully and gradually, yet quickly, poured, to ensure its running into all crevices and to avoid air bubbles. It will "set" very rapidly, and in half an hour may be safely, but very cautiously, turned out, and left to dry ; after, say, twelve hours, it should be placed in a moderately hot, ordinary kitchen oven for two or three hours, when it will be perfectly hard.

It may be found that some particles of paper have stuck to the plaster, and these should now be removed, and the edges trimmed with a sharp knife, to fit it for whatever purpose it is intended. Next dip the cast into skimmed milk several times, until it will imbibe no more, and then dry thoroughly in the sun. When dry, dust over freely with French chalk, and rub lightly all over with an old silk handkerchief, or other very soft cloth.

The cast will now present a highly polished surface, and will look more like ivory than plaster.

These medallions make most artistic ornaments when mounted in either ebony or ebonised frames.

4.—BRONZING.

An easy and successful method of bronzing articles, such as metal chimneypieces, ornamental metal work of any kind, plaster figures, etc., is to give the subject a coat of japan, in which a small quantity of Brunswick green has been mixed, just sufficient to neutralise the brown colour of the japan ; and when almost dry, apply bronze powder, either gold, silver, etc., freely with a large round camel's-hair brush to the more prominent portions of the articles in hand, but very sparingly to the other portions ; in fact, in the hollow and flat parts only a mere "suspicion." Care and some practice will be required to soften off the more highly bronzed portions, so as to avoid abruptness, and also that the brush may not take up any of the japan or paint ; but if applied with a light hand and a very soft brush the bronze powder will prevent this.

Large earthenware jars, when first sized, and then treated in this way, are most effective for decorative purposes.

A thin, even coat of good varnish will ensure the bronze keeping its colour for a very long time.

PRICE'S "UNIVERSAL" LATHE.

A Lathe with Front and Vertical Slides.

BY F A. M.

As long ago as 1883, there arose a discussion in the *English Mechanic* upon two points in lathe construction, and this discussion was continued a very long while, and it continues to reappear still from time to time. In fact, the subject appears to have excited very considerable interest. The object of the proposals which were brought forward was twofold : first, it was felt that however convenient was the usual construction of the slide lathe, with its leading screw, and its saddle sliding on the bed, for self-acting sliding, or for slide-rest work ; yet, when a piece of hand work was to be done, and, still more, if a piece of wood was to be turned, it was necessary to get rid of the saddle by sliding it to the right hand end of the bed, and lifting the poppet over it. Those who clung to the old system had much to say in its favour ; they contended that, for a bit of hand work, a rest for the hand tool can be made by fixing a slide-rest tool with the blunt end outwards, and using that blunt end as a rest, and that can often be done ; or, better still, the slide rest, in a small lathe, can be made with a tenon pin to fit into a socket ; then it can be taken out when required, and a T rest for hand-turning put in its place. Very true ; but that plan is hardly suitable for large lathes, in which the slide rest requires a more solid support. Again, it was shown how the washer securing the poppet beneath the bed could be so made that, when the fixing screw was released, it could be lifted out with the poppet, coming up through the opening in the bed, and so it could be easily and quickly removed. This, too, is quite correct, and it is a method of construction which should be always adopted. Still, there were some who considered it an annoyance to have to clear the tools off the bed, and move the saddle out of the way of chips, etc., when the hand rest was needed ; and these were inclined to favour a separate slide running along the front of the bed, on which the saddle should move, quite independently of the top of the bed, on which the headstocks, hand rest, etc., were placed ; so that, if it were desired to remove the saddle and rest in the middle of a piece of work, it would not even be necessary to take the work from between the centres, nor to disturb the poppet at all ; but only to rack or slide the saddle away past it, to the right, and place the hand rest on instead. If those who have not seen a front slide lathe will look at Fig. 1, they will understand how this can be done, and the section of the bed at Fig. 2 will explain still further.

And now, as in most improvements, it must be confessed that the advantage above mentioned is not obtained without cost. Instead of the weight and wear of the saddle falling as usual upon the broad, flat top of the bed, it comes upon the somewhat narrow, oblique edge, marked X in Fig. 2. It must, therefore, of necessity, be more liable to wear down than with the old way. To prevent this tendency, which is not of great importance in a small lathe, the front slide is made of considerable length ; and, though it might look strange, since there is no obstacle at either end, it might be well to have it longer than it is. Where two plates of metal slide on each other, the shorter must in time wear the longer hollow ; but if both are of the same length, there seems no reason why they should not keep straight indefinitely. It has, therefore, been suggested that it might be an improvement in this lathe if the front slide were lengthened, and the planed part of the bed on which it moves shortened, so as to make both, as nearly as may be, of the same length.

A far more important advantage offered by the lathe must now be mentioned. The slide rest is mounted on a *vertical slide*. Now, a vertical slide is the great want of the lathes of the present day ; it is useful in so many different ways, it is hard to name them all ; and many have been the attempts to supply the want, by additions or appliances of more or less unsteadiness, in the shape of vertical slide rests bolted upon the tool plate of the ordinary rest, or upon the seat where the quadrant plate of the rest usually goes ; and these attachments, although so unsteady and troublesome to apply and remove, are very useful. How much more, then, must be a *permanent* vertical slide, *always ready*, and *never in the way ?* This last point must be insisted upon. How many useful appliances might be, and are, added to foot lathes, which, however ingenious and well suited to the special work they are intended to do, are, nevertheless, a real trouble, and even a nuisance, when ordinary work is being done ! Rarely, indeed, is it possible to add any special appliance to a lathe without in some way interfering with its general handiness. Here, however, we have a most useful addition, always ready for use, and yet its presence might pass almost unnoticed were it not for the

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hand wheel underneath the front slide, by means of which the vertical slide is moved up and down.

About two years after the discussion on the subject of front and vertical slide lathes, there appeared in the *English Mechanic* an illustration of a beautiful little American tool, in which the idea was well carried out, probably quite independently, by the Ballou Company; but, though one or two English makers undertook to make lathes with front slides, the far more useful vertical slide was not made in England until recently it was arranged by Mr. Price, and is now being manufactured by the Universal Lathe and Tool Company, of 131, Leadenhall Street. The 3½ in. centre size is shown in Fig. 1.

The following is the description of the lathe by the makers :—

"The *Bed* is 3×4½ in. deep, so made that a leading screw can be applied if wanted for screw cutting, and has webs every 12 in. of its length. The metal is distributed to give it lightness and strength combined.

"The *Head* and *Poppet* are made so that the line of centre will be parallel with the edge of the bed. The *Mandrel* and *Collar* are of the best cast steel, and carefully hardened. The mandrel is hollow, 2⅓ in. deep, $\frac{5}{16}$ in. diameter; nose $\frac{5}{8}$ in., Whitworth's. The *Driver Chuck* is of gun metal, with steel centre; drill or cutter chuck is of $\frac{1}{4}$ in. bore. Cone pulley has four speeds.

"The *Poppet* has a steel cylinder mandrel, and it is so arranged that the hand wheel does not project beyond the barrel of the headstock, so that the front slide will pass the poppet without its being loosened.

"The *Front Slide* is fitted so that it will slide along the front of the bed, and can be locked instantly by a cam lever; the vertical slide is well fitted to saddle and arranged to rise and fall; has steel square-threaded screw and gun-metal nuts.

"The *Slide* is fitted to vertical slide bracket, and indexed to take any angle; the transverse slide is made and arranged with two T slots, and is 8 in. long and 3 in. wide. All the slides are carefully ground in, and are as firm as if they were of one piece of metal. The slide and tool holder can be placed on any part of the T slot table, and is supplied with two T rests and socket.

"The *Standards* are of the best form to give it stability and strength without being cumbersome; the *Crank* is of forged iron with steel ends for centres. The *Fly wheel* is accurately turned, and has three speeds. Treadle motion is light and strong. Approximate weight about 3½ cwt."

The makers desire it to be known that they have altered the square-looking tool-holder shown in the illustration for one which enables the tool to be set at any angle. They have arranged a backstay for turning long bars. The screw in the bed is for adjusting the position of the work when milling; there is a collar upon the screw with holes for a tommy. In turning, the upper part of the rest being in position, the longitudinal feed can be given by that, and the small screw in the bed is not needed.

The following are the various advantages over ordinary slide-rest lathes which are claimed for Price's "Universal" Lathe by the makers :—

"1. Whereas an ordinary slide-rest lathe can only be applied to turning, this lathe can be applied instantly to milling of every description, by simply putting the cutter between the centres of the lathe; and then bolting the work to the table, the cut can be adjusted to a nicety. This lathe can be applied instantly to the following work, and

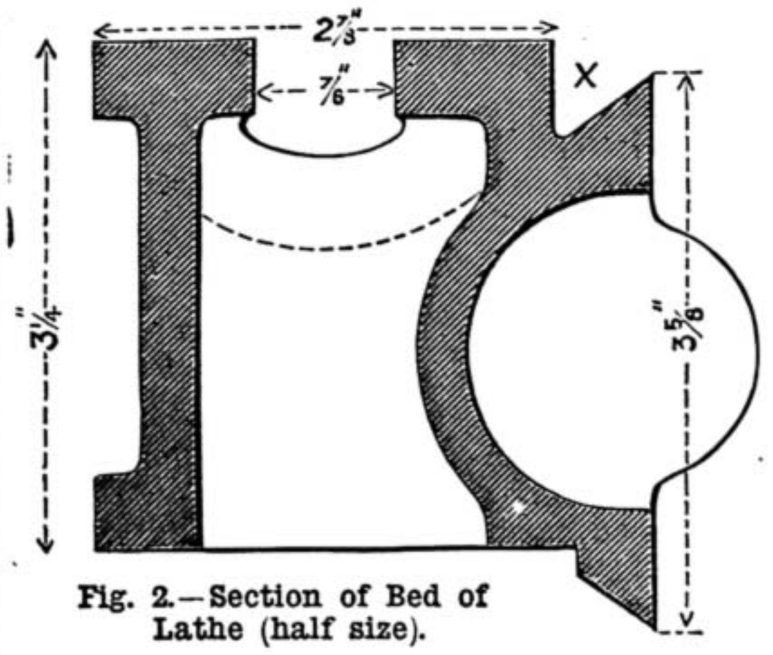

Fig. 2.—Section of Bed of Lathe (half size).

will save its cost in a few weeks in time and files. It is considered by the most scientific mechanics that it can be applied to any description of work, and that it will do the work of six different machines in one.

"2. The front slide has an enormous advantage; it can be put out of the way and replaced instantly, and is always at hand.

"3. Having a vertical slide fitted to saddle, the depth can be readjusted, and the tool can be raised and lowered according to the diameter of the work, and therefore does not require packing as in a slide-rest lathe.

"4. Poppet traverse screw is arranged out of the side of poppet, so that no chips will get into the screws, and the barrel is full length of the headstock, so that it will not spring when a heavy cut is taken."

The work that may be done by aid of this lathe may be summarised as follows :—

"(1) The vertical slide has a fall sufficient to cut gear wheels 3 in. diameter, and will cut them as small as ¼ in. diameter. (2) The lathe will turn and cut up its own cutters any form, according to shape required. (3) Most handy to mill up hexagon nuts and bolts to uniform sizes. (4) To mill up cams of any shape, face, or barrel. (5) For milling up key seatings in shafts. (6) Drilling and dividing hubs for tricycles and bicycles the same time. (7) Profiling steam ports of cylinders. (8) Profiling quadrant links of locomotives. (9) Milling the bearings. (10) Cutting slots in screws. (11) Shaping cranks. (12) Fluting taps and rimers. (13) Milling groves in dies. (14) Fluting drills that will cut equal to Morse. (15) Mill up slides for any machinery.

"Any one with ordinary skill can do all the work on this lathe without a vice or file, as it can be machined throughout."

Special attention has been bestowed on this lathe by the makers in order to render it one of the best universal machines that can be turned out. It is certainly most simple in construction, and its scope of work is wide, thus causing it to be a desirable machine for amateurs, electrical engineers, opticians, gunsmiths, and all other mechanicians.

The price of the "Universal" Lathe, with 2 ft. 6 in. bed, is £9 10s.; with 3 ft. bed, £10; with back gear, £12; if fitted for screw cutting, £20; dividing appliance, £2 10s.; vice for table, extra, 25s. It is made in larger sizes, with back gear from 3½ in. centre and 3 ft. bed, to 5 in. centre and 5 ft. bed. The prices for these sizes will be supplied by the makers to any applicant.

The writer of this notice took part in the discussion in the *English Mechanic*, and feels much pleased to see the ideas he there advocated so well carried out. The advantages of the lathe do not seem overstated, and one or two are not mentioned, perhaps because they would apply to rather larger lathes. For instance, if it were required to bore a small engine cylinder, the cylinder could be clamped upon the main transverse slide, and then by means of the screws of the slides be quickly adjusted, so that its bore would be true with the boring bar without any packing up.

Milling by circular cutters is coming into more and more extended use; but we cannot all afford to buy a milling machine. Now, only one thing is wanting to enable us to do milling in our lathes, and that thing is a vertical slide. If to that we add a bed, or table, to bolt the work down upon, as is done in this case, all we have to do, when we wish to go from turning to milling, is to remove the top slide of the rest, and we have a capital milling bed clear for the work, a mandrel to drive the cutters, and a back centre point to support and steady the end of the arbor that carries them. The lathe has become at once a very efficient little milling machine, and its powers as a tool are doubled.

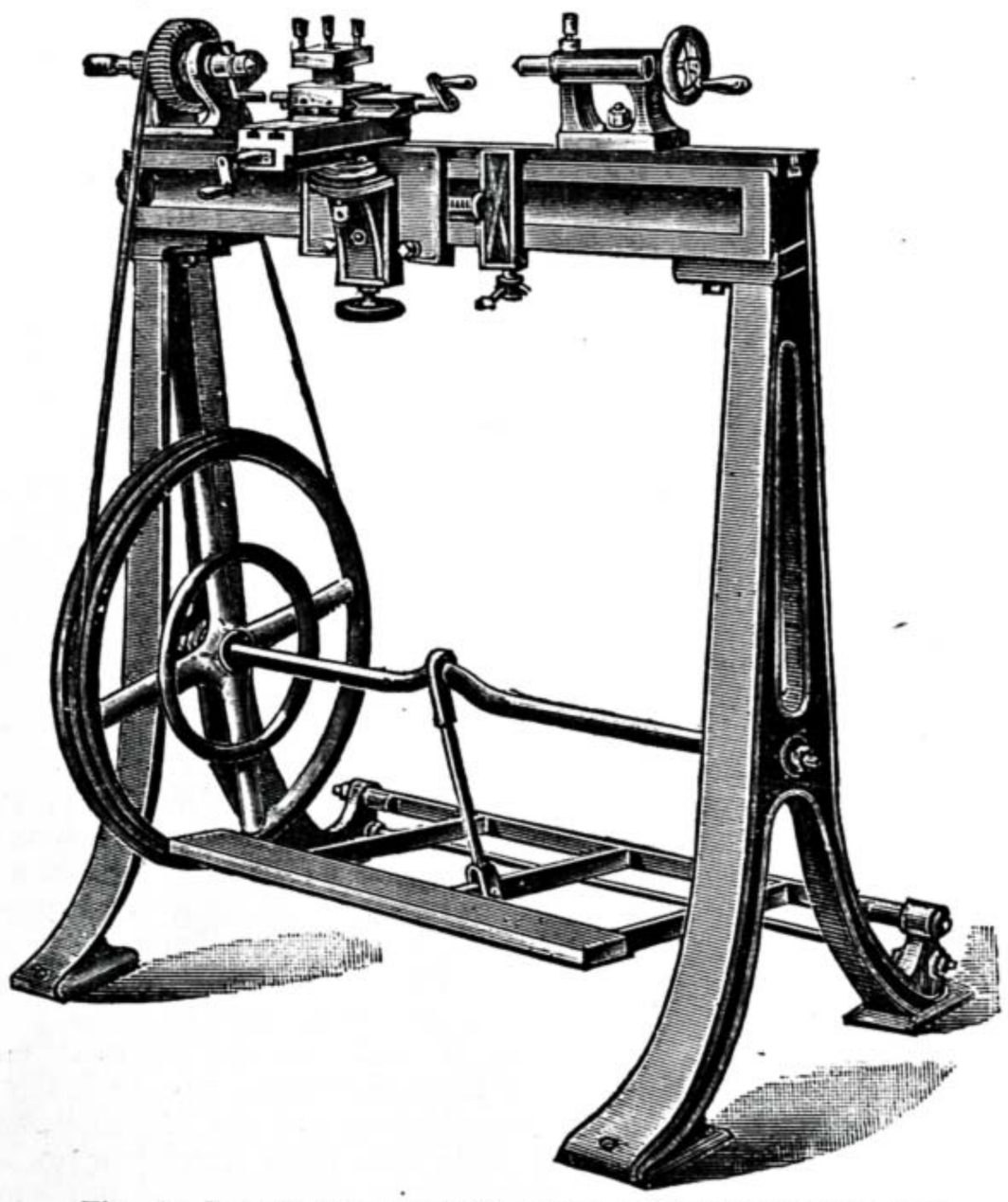

Fig. 1.—Price's "Universal" Lathe, with Front Slide and Canting Head.

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OUR GUIDE TO GOOD THINGS.

10.—Self-Centering Simultaneous Grip Chuck.

Some handy and well-finished fittings for lathes and other machine tools have been recently introduced by the London Lathe and Tool Company, 97, Pomeroy Street, London, S.E.; and as they are mostly of novel design, it is desirable to call the attention of the readers of Work to them, and to describe and illustrate some of the most useful forms.

First among them is a Self-centering Simultaneous Grip Chuck, of which an illustration is given in Fig. 1. As may be seen from the engraving, from which the principle and action of the appliance will be readily recognised, this chuck is possessed of great strength, and yet is of simple construction. It is a very handy lathe chuck for general purposes, and the Company believe they are fully warranted in asserting that it is the best and strongest of existent self-centering chucks. It is made in eleven sizes, ranging from 4 in. to 42 in. in diameter, and in price from £4 10s. for the smallest size to £52 for the largest.

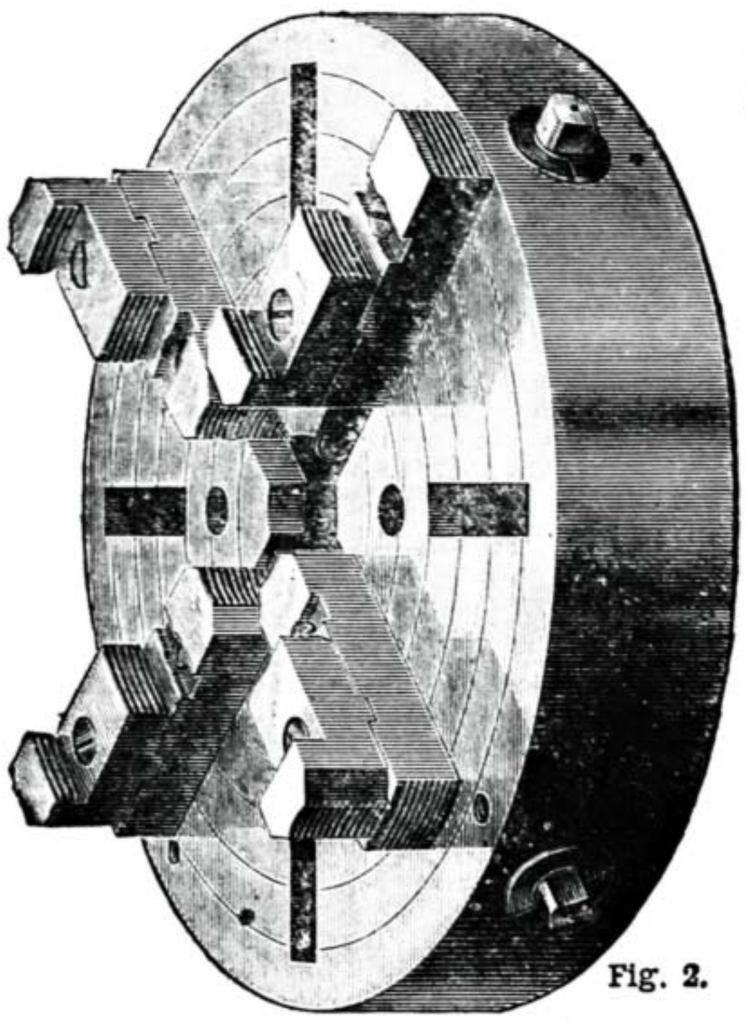

Fig. 2.

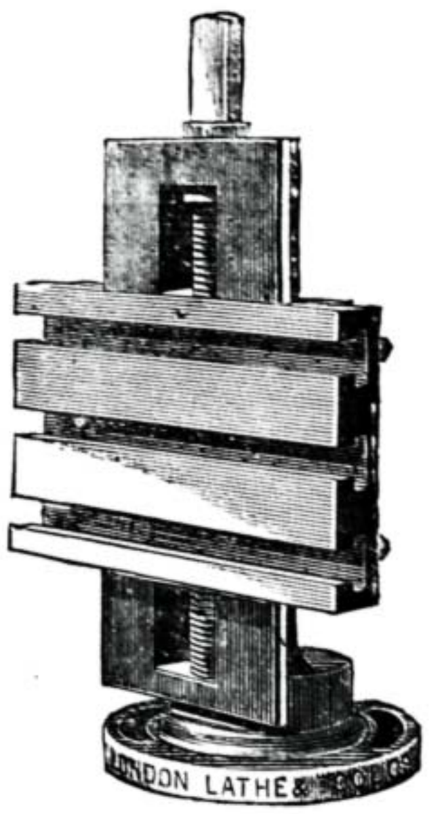

Fig. 5.

Fig. 3.

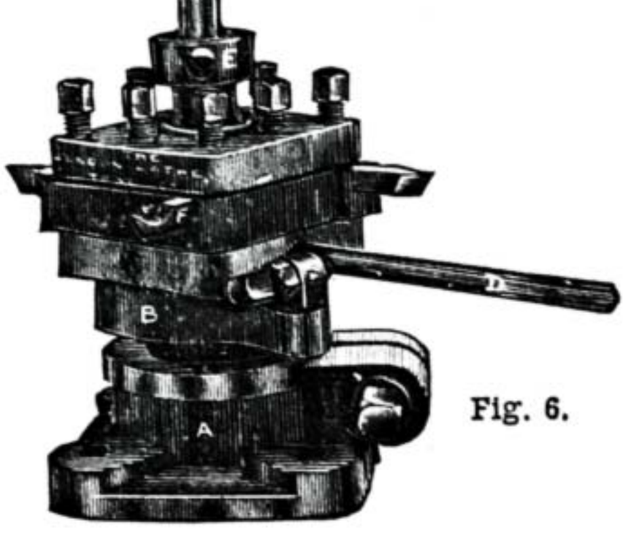

Fig. 6.

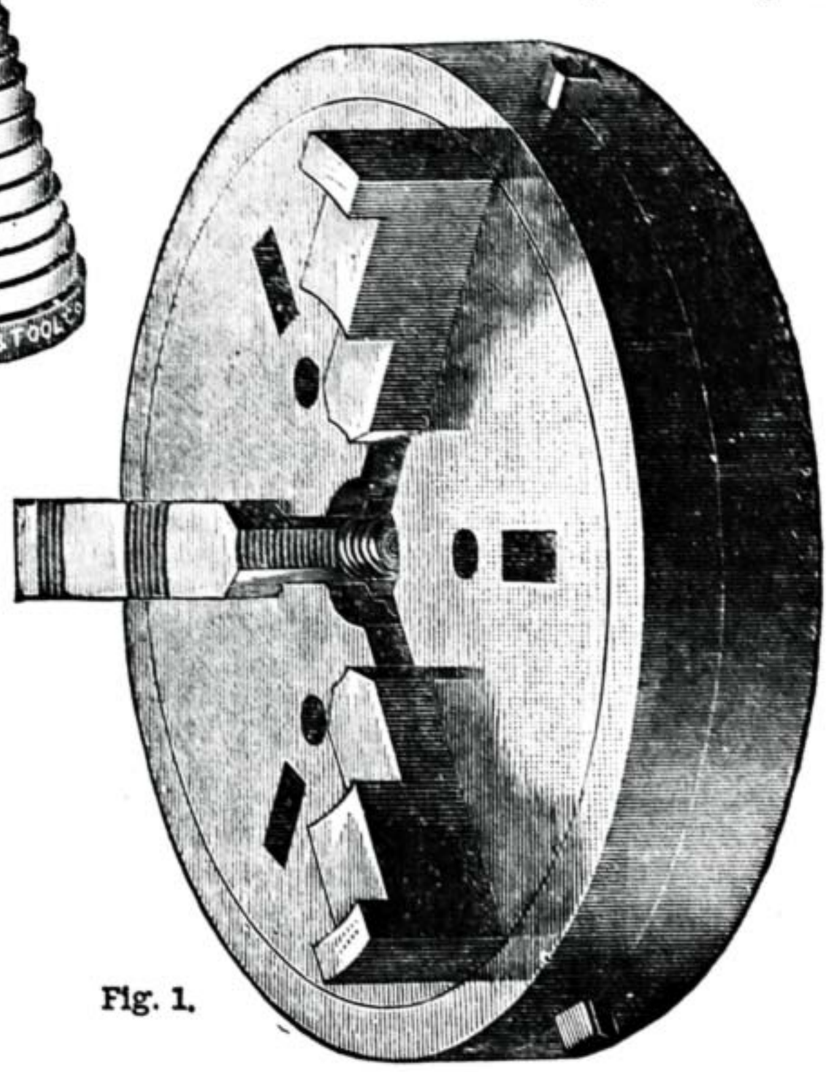

Fig. 1.

11.—Independent Grip Chuck.

Another well-made and beautifully-finished chuck is to be found in the Company's Independent Grip Chuck, which is effectively illustrated in Fig. 2. These chucks are furnished with four independent jaws, with changeable reversible grips, as may be seen by noticing the position of the jaws, as shown in the engraving, in which one is so placed as to show the reversed action. The screws used in this chuck are of steel, and the jaws of charcoal iron, case-hardened. They are made in ten sizes, ranging in diameter from 6 in. to 60 in., and in price from £4 10s. to £60. They are cheaper in first cost than the Simultaneous Grip Chucks, as will be manifest to any one who will take the trouble to compare sizes and relative prices.

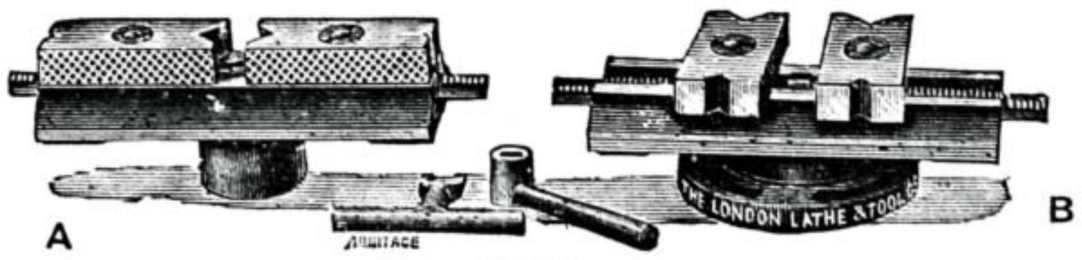

Fig. 4.

Some Specialities of the London Lathe and Tool Company. Fig. 1.—Self-Centering Simultaneous Grip Chuck. Fig. 2.—Independent Grip Chuck. Fig. 3.—Calliper Gauges. Fig. 4.—Useful Vice Chuck. Fig. 5.—Vertical Slide Rest. Fig. 6.—Revolving Slide Rest.

12.—Calliper Gauges.

It is said that if half a dozen workmen take the same dimension from the same rule with callipers, and each man turn a shaft to such callipers, careful measurement will show that no two shafts are exactly the same, and that no one shaft will be of standard size, except by chance. To reduce the possibilities of such differences in work to a minimum, the Company have introduced a useful form of Calliper Gauge, which is illustrated in Fig. 3. The gauges are made in a variety of sizes, the divisions rising by eighths, tenths, sixteenths, twentieths, thirty-seconds, and hundredths of an inch, as may be required, or gauges to the metric system can be supplied to order. Callipers, as every one will readily see, can be set to these gauges in less time than to a rule, and the work, it is said, is nearly as accurate as when ring gauges are used. To give some idea of the price, a set of gauges rising from ¼ in. to 1 in. by eighths of an inch costs 5s., but one rising from ¼ in. to 1 in. by hundredths of an inch costs 50s. The Calliper Gauges, it should be said, are made up to 3 in. in diameter. Being really very cheap, and very useful, a set can be provided for each lathe. The Company also supply gauges of flat steel, carefully hardened, for both outside and inside measurements, and plug and ring gauges. These appliances range, in flat gauges, from ¼ in. to 4 in.; and in plug and ring gauges from ⅛ in. to 4 in.

13.—Vice Chuck.

The London Lathe and Tool Company have also devised, and supply, a novel Vice Chuck, which is illustrated in Fig. 4. The chuck is made in two forms—the first to screw on to a lathe nose, as at A, and the second to bolt on to the receiving table of a lathe saddle drilling machine, or other tool, as at B. The jaws may be rotated or turned to take round or square articles at the V's, of which there are two sizes, as shown in the illustration, or to grip flat articles, or taper articles, when the jaws are brought into the position shown at B, in which their sides are opposed one to the other instead of the ends. Both jaws move together by turning the screw at either end. For light work it is believed that they will be found the handiest vice chucks that have yet been brought into the market. The price of either form for a 4-in. lathe is £2, rising to £4 for an 8-in. lathe.

14.—Vertical Slide Rest.

Vertical movements are very useful for many classes of work, and in Fig. 5 is shown a Vertical Slide Rest, specially designed by the London Lathe and Tool Company for the lathes manufactured by themselves, but which can be readily adapted so as to suit any other lathe. The receiving table may be placed at any angle, and as its slots are of the same size and pitch as those of the main table, any of the tools, sockets, or other apparatus usually fixed upon the main table may be fixed to the receiving table of the Vertical Slide Rest. The traverse screw is made with either 8 or 10 threads per inch, as may be preferred, and is finished with a micrometer collar. The constructive action and principle of the vertical slide rest may be seen from the illustration given in Fig. 5. The price of one suited to a 5-in. lathe is £3 10s., rising by £1 for each size for 6-in. and 8-in. lathes.

15.—Revolving Slide Rest.

A neat little Revolving Slide Rest to carry four tools is shown in Fig. 6. It is intended for the economical production of small screws and other articles required in large numbers and of identical shape and size; and for such a purpose as this it is clear that a revolving rest, such as the one shown in the illustration, is an absolute necessity. Hitherto capstan rests have been applied only to lathes specially constructed to take such rests, and unable, indeed, to take any other. This slide rest, however, may be used with any lathe or milling machine, and although simple in construction, it is as complete and as perfect and effective in its action as the most expensive rest in the market. It has been said that it carries four tools, such as may be necessary for the production of the article required; thus, supposing it desirable to cut some screws of a particular size and thread, the tools that are necessary are one for roughing a screw blank, a second for finishing the blank, a third for cutting the thread, and a fourth for cutting off the screw. Each tool may be separately adjusted, and the height and angle of the rest may also be adjusted, without disturbing the tools. The rest may further be

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fixed in a couple of seconds by tightening the central screw, and it may be removed from the lathe in half a minute should it be desired to make room for an ordinary slide rest.

There are many other appliances, fittings, and tools which the Company have lately introduced, and which, for simplicity, finish, and price, compare very favourably with similar articles in the market. It should be noted. however, that many of the appliances, etc., have been introduced now for the first time, and have been specially devised as labour-saving tools by the Company. I hope at some no very distant time to find space for the illustration and description of some of them in the pages of WORK.

16.—WOOD-SCREW CUTTERS.

These new tools ingeniously contrived for cutting wood screws without the intervention of the lathe are a clever invention of Peugeot Brothers, a French firm of tool makers, whose name they bear. The specimen cutter that I have is numbered 12, from which it is to be inferred that the size is indicated by this number. From actual measurement I find that it will cut a screw thread about $\frac{1}{16}$ in. deep on a cylinder $\frac{5}{8}$ in. in diameter. These cutters are clearly made in graduated sizes, but I am not able to give at the present moment the limits of size in each direction. At the end of a handle, short in itself but of sufficient length, an iron casting is attached, in the centre of which is a circular tube-like hole cut on the interior with a thread, which is the exact pattern of the screw to be cut. This, of course, is of the kind technically known as a female screw. In a groove cut in the top of the iron is a V cutter, which is held in its place by a piece of iron projecting from a bar that passes vertically through the casting in a convenient position.

Another entirely distinct and separate casting fits on the top of the first casting, being placed in the bar already mentioned, and a pin projecting from the latter near the handle. This second casting forms a prolongation of the screw-cut tube and forms a convenient entrance for the end of the wood cylinder on which it is desired to cut a screw thread. The free casting is held firmly in its place when put in position by a nut working on the vertical bar which is threaded through its entire length. Its chief use is to admit of the easy withdrawal of the V-shaped cutter when it requires sharpening. The cutter, it should be said, is further fixed and held in place by a screw passing through the fixed casting and pressing against the cutter. All that is necessary when it is desired to cut a screw thread on a cylinder is to introduce the end of the cylinder into the upper end of the tube, the instrument being held in the left hand, and then work the wood round and round with the right hand against the cutter until a sufficient portion of the cylinder has been threaded. For cutting a wood female screw to receive the wood screw thus cut an iron borer or tap is used, which is introduced into a hole sufficiently large to admit of the entrance of the end of the tap that is not threaded, and which must be formed by a centre-bit or shell-bit. The top of the tap is square in form, so that a handle may be placed on it, and the tap actuated in precisely the same manrer as a gimlet or auger.

The utility of these cutters will be obvious to all who consider how many kinds of wood work there are, and that it would be more desirable to put together, or fasten together, by dowels in which a screw thread has been cut instead of the ordinary means and modes that are usually applied. Wood clamps, too, for fret working and for other purposes can be made quickly and with the utmost ease by their aid.

These tools are of very recent introduction, and are scarcely yet on the English market as far as I am aware. As I have said, I do not at present know the sizes in which they are made, nor am I acquainted with the prices that are asked for them, but I can easily make inquiries on behalf of any one who desires further information on the subject, and give a reply through the medium of "Shop." THE EDITOR.

MEANS, MODES, AND METHODS.

*** *The Editor is not responsible for any statement made under this heading. Criticism and Suggestions are invited. Readers in possession of Tried and Approved Recipes, Formulas, and Processes, are requested to forward them for insertion in this column for the common good.*

A HINT FOR FRET-CUTTERS.—The song of the fret-saw makers might well begin :—"Break, break, break on the hard thick boards, oh, saw!" I would have put "don't" before the first break, only it would have spoiled the rhythm, but as I can't write poetry I will put in prose what I have to say, in the hope that it may be at least as intelligible as some poems. I refrain from mentioning names for obvious reasons. "It is only this," quoth the sawyer, "nothing more." Pieces of a broken band saw can easily be obtained. Bits to fit any good machine can be cut off as required. One that has been filed down till it is very narrow will do best. It will even then be much stronger than a large-size ordinary fret saw, these being all too thin and not increasing in thickness sufficiently with their width. Any ordinary work can be done with a bit of band saw more quickly and easily without such constant breakage as occurs with the usual saws. Try it, is the advice of one who knows.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

Bicycle Making. — H. W. (Newton Heath).—To lower the position of crank tread of an ordinary bicycle, I would advise you to dispense with cog wheels. You would not meet with success by the application of such to a bicycle. The best means for attaining your desire would be to fit your machine with reciprocating levers, links, and cranks, similar to those fitted to the ordinary "Facile" bicycle manufactured by Ellis and Company, London.—[C. I.]

Polishing Pebbles. — T. M. BEAR, Wellesley House, Colchester, wants books which will give information as to polishing Pebbles, Stones, etc., and show all the various tools that are necessary for the work.

Writing-Desk.—P. J. B. (London, E.).—It is satisfactory to learn that you are pleased with No. 1 of WORK, and that in writing of it you can say "it is a very good book, suitable for my purpose." The Magazine is intended to be suitable, not only for your individual purpose, but for the purposes of every workman of British and American nationality at home and abroad. Try your hand at cabinet making by all means. I can say from experience that you will find it a most pleasurable and useful occupation. If you are a novice, as I think you are, let me advise you to try your hand on something less ambitious than a writing-desk at starting, for this requires very neat and nice work, which is the outcome of practice and experience. Try some of the useful and tasteful articles that are to be described in "Artistic Furniture," and more especially the "Screen Secretary," which will appear very shortly, and which, I think, will go far to meet your present want. Instructions for making a handsome and serviceable writing-desk will be given by-and-by, with the necessary explanatory diagrams and working drawings. It is not possible to touch on everything at once, a fact which you, as a sensible man, will readily acknowledge. Meanwhile, to you and all readers of WORK, I must say, after the manner of notices that one sometimes sees in the shops—If you do not see what you want, ask for it. I can assure you that no pains shall be spared to comply with any and every request, at least in time, if not directly.

Photo-Lithography.—PEN AND INK.—In reply to your query on this subject, I cannot do better than direct your attention to the latter portion of the preceding reply. Will you kindly write again and specify distinctly what your special need may be, and the purpose for which you wish to acquire a knowledge of the art? It may be that I may be able to offer some suggestions that will serve your purpose in the interval before papers can be given on the subject you name.

Photography.—R. A. R. B. (Oxford).—The photographers are buzzing round WORK like flies round honey, and early in the field as you may seem to be, I am bound to say that arrangements are in progress for articles on this most interesting subject by an old photographic hand. The road, however, is open for suggestions on all branches of photography, and all who like to send in papers on special points will meet with due consideration.

*** *Many answers are held over for want of space.*

Trade Notes and Memoranda.

TOPICS OF THE HOUR.—The improvement of Public Buildings in London.—Ventilation of Schools—School Board architecture.—The Campo Santo and the County Councillors.—The Sanitary Registration of Buildings Bill.—Hardening and tempering by Electricity.—Our coal supply.—Smoke in the air.

STRATFORD-ON-AVON Church is to be lighted by electricity.—Portable wooden houses are being sold by a Swedish joinery company.—An improvement in grates is suggested, which enables the fire to be replenished with fresh coals below on to live coals above.—The London County Council wants a home.—An "Irving Safety" plan theatre is to replace the Exeter theatre burnt in 1887.—There are signs in the coal districts that English coal is becoming scarcer.—Sheffield requires a ship canal to the sea.—A Philadelphia company is supplying houses with heat from hot water mains.—It is proposed to rate advertising hoardings and places.

MR. OUSPENSKY, a Russian engineer sent to Central Asia on a special scientific mission, reports that the oil wells at Penjakend, near Samarcand, in the Zerafshan Valley, contain at least 9,000,000,000 lbs. of perfectly pure oil.

THE man with his barrow and his broom is to be brushed aside for ever. He is being crushed out of existence by machinery. There has been successfully tried in London a new machine which does all at once which the scavenger and his besom, and his shovel, and his scraper, and his barrow do, one after the other. It is a street-cleansing machine. Its horizontal brushes, fixed on a pair of endless chains revolving around spindles, sweep the mud into a receiver. From that receiver a series of buckets, fixed on endless chains, lifts the mud into a shoot, which delivers it into the mud cart. The travelling wheels on which the apparatus is mounted set the mechanism going.

VERY little is now wanted to complete the thousand feet of the Eiffel Tower. It is expected, therefore, that this modern Babel will be finished, as far as height goes, shortly. The lifts were to be in operation by April 1st. There is every appearance that all will be ready for the opening on the 1st of May.

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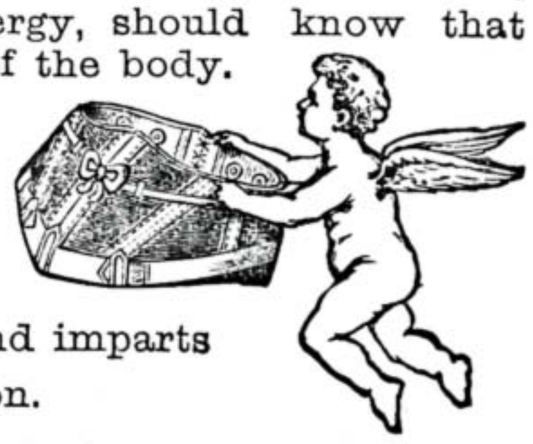

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